/016.5515/A5 Illinois U Library

AMERICAN METEOROLOGICAL SOCIETY

meteorological

bstracts and bibliography

Sponsored by
AIR FORCE CAMBRIDGE RESEARCH CENTER

Annotated Bibliography on Tropospheric Propagation (1953–1957), p. 1374

Sponsored by the
National Bureau of Standards Boulder Laboratories

8 October 1957 No. 10

METEOROLOGICAL ABSTRACTS AND BIBLIOGRAPHY

EDITORIAL STAFF

Editor and Technical Supervisor: MALCOLM RIGBY
Corresponding Editor: DR. C. E. P. BROOKS

FULL TIME

ISADORE L. DORDICK, *Chief Analyst*
MARY L. RICE, *Assistant Editor-Bibliographer*
WILHELM NUPEN, *Assistant Analyst*
DOROTHY M. GROPP, *Chief Cataloguer*
GEZA THURONYI, *Bibliographer*

PART TIME

ANDREW ASSUR, *Analyst*
ALEXIS M. POUSHKIN, *Assistant Analyst*
DORA M. BROOKS, *Subject Cataloguer*
WINIFRED SCHRAITLE, *Subject Cataloguer*
MARINA SZE, *Indexer*
MARGARET MATTHEWS, *Descriptive Cataloguer*
KATHERINE MARTINOFF, *Technical Editor*
ROBERT PANARA, *Assistant Technical Editor*
SUSANNE MANOVILL, *Assistant Technical Editor*
BEVERLY HUGHES, *Assistant Technical Editor*
HELEN I. TROUTMAN, *Assistant Technical Editor*

*EDITORIAL OFFICE: Washington, D. C. P.O. ADDRESS: Box 1736, Washington 13, D. C. Telephone: REpublic 7–6278.

ADMINISTRATIVE OFFICE: American Meteorological Society, Office of Executive Secretary, 3 Joy Street, Boston 8, Mass.

* Address all business communications, orders and inquiries to the Executive Secretary, Mr. Kenneth C. Spengler, 3 Joy Street, Boston 8, Mass. Exchanges and reprints may be sent direct to P. O. Box 1736, Washington 13, D. C.

METEOROLOGICAL ABSTRACTS AND BIBLIOGRAPHY is a monthly publication devoted to:

A. Current Abstracts in English on important meteorological literature in every language.

B. Bibliographic references to other items of interest to the profession.

C. Selective, annotated bibliographies on subjects of immediate and special interest to meteorologists.

SUBSCRIPTION RATE: $8.00 per year to members and non members. Single and back issues $2.00. Back volumes, $10 per volume.

This publication has been made possible through support and sponsorship extended by the Geophysics Research Directorate of the Air Force Cambridge Research Center, Air Research and Development Command, under Contract No. A. F. 19 (604)-2062.

METEOROLOGICAL ABSTRACTS AND BIBLIOGRAPHY

MALCOLM RIGBY, Editor

Vol. 8 OCTOBER, 1957 No. 10

SPECIAL FEATURE IN THIS ISSUE

Annotated Bibliography on Tropospheric Propagation (1953–1957)

By

Wilhelm Nupen

Prepared for

National Bureau of Standards Boulder Laboratories

(*For complete table of contents see back cover*)

Published monthly at Prince and Lemon Streets, Lancaster, Pa., by the AMERICAN METEOROLOGICAL SOCIETY, 3 Joy Street, Boston 8, Mass.

Printed and issued by: Lancaster Press, Inc.

FOREWORD

Meteorological Abstracts and Bibliography is a monthly publication whose purpose is to bring to the attention of meteorologists current literature in their field and in related fields and to provide bibliographic information on various subjects, as interest demands.

Part I contains abstracts of current literature in the fields of meteorology, oceanography, etc., arranged according to the Universal Decimal Classification.

Part II of each issue comprises an annotated bibliography of important references on a special subject (usually arranged chronologically). No attempt is made to prepare exhaustive bibliographies; instead, the aim is to include a representative cross section of the various aspects of a subject.

Bibliographies published in the successive issues were:

Vol. I, 1950

1. Atmos. Pollution	2. Aerobiology	3. Cloud Physics	4. Hail
5. Tornadoes	6. Volcanic Dust	7. Climat. Changes	8. Thunderstorms
9. Icing	10. Acoust. Propagation	11. Evaporation	

Vol. II, 1951

1. Extended Forecast.	2. Long Range Forecast.	3. Soil Temp.	4. Constants, etc.
5. Clim. of Near East	6. Clim. of Middle East	7. Special Winds	8. Radar Storm Detect.
9. Condensation Trails	10. Clim. of N.E. Africa	11. Mountain Met.	

Vol. III, 1952

1. Clim. of N.W. Africa	2. Carbon Dioxide	3. Clim. of Argentina, etc.	4. Dew
5. Objective Forecast.	6. Stratus Forecast.	7. Urban Climatology	8. Clim. of C. Africa
9. Visibility	10. Glaze and Rime	11. Free Air Turbulence	

Vol. IV, 1953

1. Turbulence Theory	2. Turbulent Diffusion	3. Frost	4. Clim. of Australia, etc
5. High Level Winds	6. Winds in Stratosphere	7. Jet Stream	8. Radiation Bioclim.
9. Clim. of Pacific	10. Auroras	11. Sferics	

Vol. V, 1954

1. Oceanog. Met.	2. Clim. of S.E. Asia	3. Auroral Physics	4. Tropopause
5. Balloons	6. Numerical Forecast.	7. Radiation Data	8. Vertical Motion
9. Clim. of Arctic	10. Industrial Met.	11. Wind Waves and Swell	

Vol. VI, 1955

1. Bibliog. of Bibliog.	2. Texts & Monogr. Bibliogs.	3. Storm Surges
4. Ionospheric Prop.	5. Photochem.—Upper Atmos.	6. Cloud Physics
7. Radar Cloud Physics	8. Atmos. Nuclei (1841–1950)	9. Atmos. Nuclei (1951–1955)
10. Weather Modification	11. Cooling Power	

Vol. VII, 1956

1. Synoptic Met.-Arctic	2. Clim. of Enclosed Spaces	3. Cosmic Rays (–1952)
4. Cosmic Rays (1953–56)	5. Atmos. Radioactivity	6. Inversions
7. Snow Micromet.	8. Snow Micromet. (Suppl.)	9. Tropical Cyclones
10. Hurricane Damage	11. Tropical Cyclone Theory	

Vol. VIII, 1957

1. Solar Relations with Weather
2. Night Airglow
3. Forecasting of Special Elements
4. Forest Micrometeorology
5. Hydrometeorological Forecasting
6. Numerical Forecasting (Suppl.)
7. Albedo
8. Meteors
9. Tropospheric Propagation (–1952)
10. Tropospheric Propagation (1953–57)

Other bibliographies in preparation are:

Actinometers
High Atmosphere Temperatures
Human Bioclimatology
Microwave Propagation
Ozone
Radio Astronomy
Singularities
Synoptic Aerology

Part III contains a listing of reviews, translations, reprints, and the contents of important publications. These are published in the earliest issue where space permits.

Part IV is made up of author, subject and geographical indexes. The December issue comprises cumulative author, subject, geographical and journal indexes.

EXPLANATIONS

Location of material: For each entry, a symbol is given for at least one library where the material may be found. The Union List of Serials (Gregory) is the source of most of the symbols used. In some cases, where no symbol has been assigned to a library, one will be devised according to the principles of the Union List.

Library symbols used frequently may be found in the following list:

DA:	U. S. Dept. of Agriculture Library, Washington, D. C.
DBS:	U. S. Bureau of Standards Library, Washington, D. C.
DGS:	U. S. Geological Survey Library, Washington, D. C.
DLC:	Library of Congress, Washington, D. C.
DN-HO:	U. S. Navy Hydrographic Office Library, Suitland, Md.
DNLM	U. S. National Library of Medicine, Washington, D. C.
DSI:	Smithsonian Institution Library, Washington, D. C.
DWB:	U. S. Weather Bureau Library, Washington, D. C.
GB-MO:	Great Britain, Meteorological Office Library, Harrow, England.
MH-BH:	Harvard University, Blue Hill Observatory Library, Milton, Mass.

Other symbols:

*	before an entry indicates a good data source.
†	before an entry indicates a good bibliography.
§	before an entry indicates a synoptic case history study accompanied by charts.

Geographic locations are in the English form rather than the form used locally, for example Moscow for Moskva.

Titles of articles or monographs are in the language of the original article unless otherwise stated. Slavic (Cyrillic) titles are transliterated into the Roman alphabet according to the Library of Congress transliteration scheme.

Abbreviations:

Titles of periodicals are not abbreviated, as a rule.

The months of the year from March to July are not abbreviated. Other months are abbreviated as Jan., Feb., Aug., Sept., Oct., Nov., and Dec.

The word or abbreviation for Volume (Tom, Band, Jahrgang, Año, etc.), for Number (Heft, Fascicule, Vypusk, etc.) and for page or pages is omitted from most entries. Thus an entry will read as follows:

Meteorologische Rundschau, 2(5/6):146–151, May/June 1950.

This indicates that the article appeared in *Meteorologische Rundschau, Jahrgang* 2 (Vol. 2), *Heft* 5/6 (No. 5/6), *pages* 146–151, May/June 1950.

PART I. ABSTRACTS OF CURRENT METEOROLOGICAL MATERIAL

MAJOR GENERAL WORKS

COLLECTED WORKS

8.10–1 551.5(98)

Arctic Research: the current status of research and some immediate problems in the North American Arctic and Subarctic. *Arctic*, Montreal, 7(3/4):117–375, **1954.** figs., tables, bibliog. Also issued as *Arctic Institute of North America, Special Publication*, No. 2, **1955.** 261 p. **DLC.** Contents: Rae, R. W., **Meteorological activities in the Canadian Arctic,** p. 119–128. Baird, P. D. and Sharp, R. P., **Glaciology,** p. 141–152. Legget, R. F., **Permafrost research,** p. 153–158. Colbert, L. O., **Geophysical research in Alaska,** p. 159–164. Joesting, H. R., **Geophysical exploration in Alaska,** p. 165–175. Beals, C. S.; Hodgson, J. H.; Innes, M. J. S. and Madill, R. G., **Problems of geophysics in the Canadian Arctic,** p. 176–187. Davies, Frank T., **The ionosphere over Northern Canada,** p. 188–190. Iselin, C. O'D., **Oceanographic problems of the Arctic ocean,** p. 195–198. Colbert, L. O., **Tidal data in the North American Arctic,** p. 199–200. Armstrong, Terence, **Sea ice studies,** p. 201–205. Rawson, D. W., **Limnology in the North American Arctic and Subarctic,** p. 206–212. Mick, Allan H. and Johnson, Hugh A., **Soil resources and agricultural development in Alaska,** p. 236–248. Brown, G. Malcolm, **Cold acclimatization in Eskimo,** p. 343–353. **Field research projects sponsored by the Arctic Institute of North America,** p. 354–366. **Library projects sponsored by the Arctic Institute of North America,** p. 366.—This volume, published as one issue of the quarterly "Arctic" and also as a separate cloth bound volume, is dedicated to and has an Introduction by R. C. WALLACE, Executive Director of the Arctic Institute who died in Jan. 1955. The Institute was 10 years old in 1955, and had sponsored 177 projects in a great variety of fields of endeavor, including climatology, glaciology, oceanography, paleoclimatology, evapotranspiration, etc. The papers presented were written between 1953 and 1955, and most were brought up to date at time of publication. A list of projects, classified by broad subject areas, appears on p. 242–254, and an author-subject-place index on p. 255–261 of the bound volume. *Subject Headings:* **1. Arctic research 2. Arctic Institute of North America 3. Arctic. I. Rowley, Diana** (*ed.*) **II. Arctic Institute of North America.**—*M.R.*

8.10–2 551.586:612.275.11

*†Moscow. Institut Aviatsionnoĭ Meditsiny i. I. P. Pavlova, **Fundamentals of aviation medicine.** Compiled by A. P. Apollonov, etc. Ed. by W. E. Voyachet et al. Trans. by Iser Steinman. Edited and distributed as a confidential document under the auspices of the Association Committee on Aviation Medical Research of the National Research Council, Canada, **1943.** 377 p. 118 figs. (incl. photos), 43 tables, bibliog. p. 359–377. Trans. of the original Russian **Osnovy aviatsionnoĭ meditsiny. DLC**—This textbook of aviation medicine, written by scientists of the Pavlov Institute of Aviation Medicine of the Soviet Air Force, represents a summary of the fundamentals of aviation medicine as known at the start of World War II. Chapters of meteorological interest are found in Pt. 1, **Effect of atmospheric conditions and physical factors of flight on the aviator,** translated contents of which is as follows: Apollonov, A. P.: **Brief discussion of the physical factors of the atmosphere,** p. 3–25. Apollonov, A. P.: **Pulmonary respiration at high altitudes,** p. 26–38. Vladimirov, G. E.: **Respiratory function of the blood and tissue respiration at diminished atmospheric pressure,** p. 39–45. Vladimirov, G. E.: **Effect of low atmospheric pressure on metabolism,** p. 46–57. Streltzov, W. W.: **Effect of diminished barometric pressure on digestion,** p. 58–60. Vishnevsky, N. A. and Belostotsky, E. M.: **Effect of atmospheric conditions and physical factors**

of flight on the organ of vision, p. 67–78. Kulikovsky, G. G.: **Effect of atmospheric conditions on the ear, nose, and throat,** p. 79–85. Other parts of the book are **Aviation hygiene, Medical supervision of high-altitude flights and parachute jumps** and **Medical selection of candidates for primary and advanced aviation and investigation of flying personnel.** *Subject Headings:* **1. Aviation medicine 2. Medical meteorology 3. Textbooks. I. Voyachet, W. E.** (*ed.*) **II. Apollonov, A. P.** (*comp.*) **III. Steinman, Iser** (*trans.*).—*I.L.D.*

TEXTBOOKS AND TECHNICAL BOOKS

See also: **Aviation medicine, 8.10–2; Snow** (Bell), **8.10–10.**

8.10–3 551.510.42:551.509.9

†Rose, Horace Edgar and Wood, A. J., **Introduction of electrostatic precipitation in theory and practice.** London, Constable, **1956.** 166 p. figs., tables, refs. at end of each ch. **DWB, DLC** (TP156.P7R6)—This book is not a textbook or a design manual, but a critical survey of the literature and an analysis of data (presented in graphical form) on electrostatic precipitation of fine particles in gases. It is intended for students, particularly students interested in air pollution control. The several chapters discuss electrical theory, precipitator efficiency from theoretical and from practical viewpoints, precipitator problems, design, construction, power supply and, finally, limitations. Effects of turbulence, humidity, ions, particle size and other factors are considered. *Subject Headings:* **1. Atmospheric pollution control 2. Dust precipitators 3. Electrostatic precipitators.**—*M.R.*

8.10–4 551.58:559.9:574.9

Anderson, Margaret S., **Geography of living things.** New York, Philosophical Library, **1951.** 202 p. photos. **DLC** (GF37.A55)—Biogeography is defined by the author as "the study of the biological relations between man, considered as an animal, and the whole of his animate and inanimate physical environment." The author discusses as one of these relationships the "direct effects of his environment upon man." This comprises a simple and descriptive account of the influence of the effects of atmospheric pressure, temperature, humidity, solar radiation and wind upon human physiological behavior and man's responses to these effects to attain equilibrium and adaptation. *Subject Headings:* **1. Biogeography 2. Climatic effects.**—*I.L.D.*

8.10–5 551.582(51):016

†Cressey, George Babcock (*Prof. of Geography, Syracuse Univ.*), **Land of the 500 million, a geography of China.** New York, McGraw-Hill, Inc., **1955.** 387 p. numerous figs., photos, and tables, bibliog. p. 357–380. **DWB**—Ch. 3 (p. 55–79) of this fascinating book deals with the climate and weather of China, and Ch. 4 (p. 80–100) with water, rivers, floods, drought and irrigation. The former chapter gives some original charts showing climatic analogs with parts of the U. S. ranging from Nevada with far western Sinkiang; to Florida with Kwantung; and Saskatchewan with Heilungkiang (data from NUTTONSON); rough isohyetal, isothermal and growing season charts, etc. A fairly good discussion of air masses, typhoons, cyclones, rainfall and temperature, and tables of climatic data for about 50 places in 26 provinces, and an extensive bibliography (p. 361–2) together with a subject, place and author index, make this a useful as well as ornamental text. Each regional chapter (8–13) includes a discussion of the climate peculiar to that region together with climatic histogram charts of the conventional type (temperature and precipitation). *Subject Headings:* **1. Climate of China 2. Bibliography on climate of China 3. China.**—*M.R.*

8.10–6 551.582(268)

†Herrmann, Ernst, **Das Nordpolarmeer: das Mittelmeer von Morgen.** [The Arctic Ocean: the Mediterranean of tomorrow.] Berlin, Safari-Verlag, **1949.** 343 p. 43 figs. (incl. photos), 35 maps and charts, and 101 refs. **DLC** (GC401.H4)—Following the theme that the Arctic Ocean is one of the 4 Mediterranean Seas of the world (European, Caribbean, Australian and Arctic), the author devotes one chapter to a description of these seas and their

history, one to climate and geography, one to biological aspects of the Arctic, one to the Northwest Passage, the Northeast Passage, the Pole itself and, finally, one to the various recent air and sea expeditions to or near the Pole for scientific purposes. The chapter on **Geophysics** (p. 34–101) goes fairly deeply into various aspects of the climate, geomagnetism, the aurora, glaciers, sea ice, oceanography, currents, radiation, lapse rates, pressure distribution, etc. The drifting stations of the Papanin and "Sedov" Expeditions and the "Fram" and "Maud," and their meteorological importance are covered in some detail in the appropriate chapters. *Subject Headings:* **1. Arctic expeditions 2. Climate of Arctic Basin 3. Arctic Ocean.**—*M.R.*

8.10–7 551.58:599.9:591.9:572.9(02)

†Huntington, Ellsworth, **Principles of human geography.** Based on original work in collaboration with Sumner W. Cushing. 6th ed. rev. by Earl B. Shaw. Cartographic rev. by Jameson Macfarland. New York, John Wiley; London, Chapman & Hall, **1951.** 808 p. figs., charts, tables, refs. at end of many chs. **DLC**—In this standard textbook for beginners in college geography, the *human* aspects of geography rather than the *geographical* are stressed. Hence climate and its effects on man are emphasized rather than meteorology and its effects on geomorphology as in some geography texts. Several chapters are devoted to climate: Ch. 5 (p. 101–128) on **Climate and climatic zones;** Ch. 6 (p. 129–158) on the **Climate of continents and oceans;** Ch. 9 (p. 248–279) on the **Influence of the Oceans;** Ch. 14 on **Climate and life** (p. 399–416); and Ch. 23 (p. 615–632) on **Climate and history.** Some treatment of climatic influences or local climates will be found in other chapters (land forms, physiography, soils and minerals, regional relations, tropics, deserts, polar regions, etc.). Two new chapters are added in this edition, Ch. 14 and 23, the former taken from **White settlers in the tropics** by A. Grenfell Price and the latter from **Climate through the ages** by C. E. P. Brooks (*see* F–4, June 1950, *MAB*). The treatment in all of these chapters is somewhat more sophisticated than that in elementary (grade school) texts of this type. The concept of civilization and climate promulgated by HUNTINGTON in many of his works pervades the text. *Subject Headings:* **1. Human geography 2. Geography textbooks 3. Climate and man. I. Cushing, Sumner W. II. Shaw, Earl B.**—*M.R.*

8.10–8 551.582.1(6)91(02)

†Stamp, Laurence Dudley (*Prof. Social Geog., London Univ.*), **Africa: a study in tropical development.** N. Y., John Wiley; London, Chapman & Hall, **1953.** 568 p. numerous figs. (incl. fold. maps), foot-refs., bibliogs. at end of many ch. **DWB**—Ch. 4 (**African climates and the water problem**) of this new book on the economic and human geography of Africa takes up the general climatic conditions of Africa, then the equatorial or tropical rain forest climate, the windward coast, the tropical savanna, low latitude deserts and steppes, middle latitude steppe, Mediterranean climate, humid subtropical climate, highlands, climate and the African, climate and the white man, and the African water problem. The several sections contain illustrations, temperature and rainfall graphs, etc. The notion that tropical Africa is unfit for white man or for physical labor is refuted. However, many areas are unfavorable because of high temperature, humidity and disease. No part of Africa has adequate or stable (from year to year or season to season) rainfall, so water is the acute problem. *Subject Headings:* **1. Climate of Africa 2. Geography textbooks 3. Africa.**—*M.R.*

POPULAR METEOROLOGY

See also: **Mystery of upper air** (Engel), 8.10–128.

8.10–9 551.583

Baxter, William J., **Warmer weather! Boom in North.** Illus. by Virgil Partch. N. Y., International Economic Research Bureau, **1955.** 92 p. Price: $1.80. **DWB**—An earlier popular book by the author (*see* 7.2–246, Feb. 1956, *MAB*) entitled **Today's revolution in weather** (131 p.) sold over 255,000 copies thus becoming the most popular book about weather ever published, in fact equalling the total sales of all other popular books on meteorology

published during the past generation." This new book supplements the first by presenting additional evidence from literature (mostly English, American and Russian) of the 1951–55 period, to support the author's thesis that the Arctic is warming up at an irregular but substantial rate, and that the sub-tropical or temperate areas that are now semi-arid are becoming hotter and dryer—hence the march of civilization is northward and will continue to be so. He also maintains that the oceans are rising due to melting ice, that hurricanes (and storm surges) are on the increase in the northeastern U. S. A., and that the Russians are "thawing out." *Subject Headings:* **1. Climatic variations and human activity 2. Popular meteorology books.**—*M.R.*

8.10–10 551.578.4:087.5

Bell, Thelma Harrington, **Snow with drawings by Corydon Bell.** New York, *Viking Press*, **1954.** 55 p. numerous figs. **DLC** (QC929.S7B37)—The various forms, processes of formation, and benefits or dangers of snow or snowflakes are described in narrative style with nice illustrative drawings in blue and white, for the juvenile reader. The several chapters discuss snow cover, snowfall, snow surveying, igloos, avalanches, snow formation in clouds, types of snowflakes, frost, rime, glaze, sleet, hail and laboratory snowflakes and experiments with snow. *Subject Headings:* **1. Snow 2. Juvenile textbooks. I. Bell, Corydon.**—*M.R.*

8.10–11 551.515.2(023)

Fuerst, Robert E., **The typhoon-hurricane story.** Rutland, Vermont, Charles E. Tuttle Co., **1956.** 172 p. 5 figs., 32 photos, 8 refs. **DWB**—A breezy book on hurricanes and typhoons, written by one who had experience in the Far East with typhoons. It contains numerous quotations from accounts of the nature and damage from tropical cyclones from the 15th century to the latest named (1955) typhoons and hurricanes. Modern methods of reconnaissance by airplane, radar and dropsonde, rules for safety during hurricane winds, rains or tides or at sea, photographs of clouds, damage and seas, radar scope photos, etc. add to the interest in the book. Some casual bits of misinformation do not detract from the overall authenticity of the book. In one place an almost prophetic statement appeared; in the light of the events connected with hurricane "Audrey" of 1957. On p. 159 the author says "Or take Sam. Sam lives about 150 miles north of New Orleans. The hurricane heading his way is no worry to Sam—'everybody knows they all die down to practically nothing after they get inland a little way, and this one will do the same.' It's people like Sam who explain why in many recent storms the loss of life in the interior has exceeded that in coastal communities, where the storm is much more severe but also where residents faithfully take recommended preventions." *Subject Headings:* **1. Popular meteorology 2. Hurricanes 3. Typhoons 4. Hurricane damage.**—*M.R.*

8.10–12 551.510(04)

Philipps, Horst, **Wettergeschehen als physikalischer Vorgang.** [Weather events as physical processes.] Leipzig, Urania-Verlag, **1955.** 43 p. 16 figs. *Gesellschaft zur Verbreitung wissenschaftlicher Kenntnisse. Vortragsreihe Naturwissenschaften*, Vol. 20. **DLC**—A pamphlet presenting the text and illustrations used by the author in a popular lecture on the structure and physics of the atmosphere, cyclones, fronts, cloud physics, atmospheric tides, etc. *Subject Headings:* **1. Popular meteorology 2. Atmospheric physics 3. Atmospheric structure.**—*M.R.*

8.10–13 551.509(09)

§Wehner, Hans and Ziemann, Rudolf, **Wie entsteht die Wettervorhersage?** [How did weather forecasting originate?] Leipzig, Urania-Verlag, **1955.** 95 p. 17 figs. (incl. photos) 2 fold., 11 refs. **DLC** (QC995.W37)—A pocket sized book giving the basic knowledge of the history of synoptic networks, the present codes, communication systems, methods of analysis and forecasting, including long range and singularity forecasting. Many illustrations of equipment, techniques and forms, maps, etc. are included. The number of synoptic reporting stations in the world is given as 7000 as of the early 1950's. *Subject Heading:* **1. History of weather forecasting.**—*M.R.*

MONOGRAPHS AND COMPREHENSIVE PAPERS

See also: **IGY meteorology program** (WMO), 8.10–34; **Turbulence over eastern N. Atlantic** (Rohan), 8.10–55; **Final report of Operation overseed** (Mt. Washington Obs.), 8.10–117; **Climatic data, N. Mex.** (N. Mex. State Engr. Off.), 8.10–260; **Precip. data, N. Mex.** (N. Mex. State Engr. Off.), 8.10–261.

8.10–14 551.579.5 551.582.2(43)

†*Bollmann, Hans, **50 Jahre Grundwasserbeobachtungsdienst in Mitteldeutschland.** [50 years of ground water observation service in central Germany.] *Deutsches Gewässerkundliches Jahrbuch, Besondere Mitteilungen*, No. 17, pub. Berlin, Akademie Verlag, **1957.** 94 p. 28 figs. (some fold.), 6 tables, 3 maps (fold. in pocket), 35 refs. **DWB** (P D 486v)—Climatic conditions in the Halle, Leipzig and Magdeburg region, especially as affected by orography, are discussed and tabular data for winter and summer given for 7 characteristic stations; isohyetal charts and a "profile" of precip. for 1893–1912, and 1891–1930 from Seesen to Röblingen am See as one crosses the divide (elev. 220 m to 1142 m at Brocken and down to 94 m on the opposite side, with precip. 800 mm to 1700 mm to 434 mm, respectively), presented on p. 17–23. Large folded charts give precip.-ground water and other parameters for various places. Discussion of ground water, soil, geological, industrial and agricultural factors over a long period of time is quite extensive. *Subject Headings:* **1. Climate of Central Germany 2. Precipitation-ground water relationships 3. Central Germany.**—*M.R.*

8.10–15 551.577.36

*Bultot, Franz, **Risques d'années sèches et pluvieuses au Congo Belge et au Ruanda-Urundi.** [Risks of years of drought and rain in the Belgian Congo and Ruanda-Urundi.] *Institut National pour l'Étude Agronomique du Congo Belge, Brussels, Bureau Climatologique, Communications*, No. 13, **1957.** 22 p. 4 charts, 6 tables, 4 refs. **DLC**—The annual rainfall records for the Belgian Congo are analyzed statistically and the data presented in tables and large folded maps to show the probability of obtaining specified values of precip. one time in 10, or one time in 40, or of not attaining a specified value one time in 10 or 40 (years). Methods are explained in detail. Data for 1930–54 for 61 stations are used. "Risks," and "forecasts" of dry and wet years are also discussed in text. *Subject Headings:* **1. Rainfall probability 2. Drought frequency 3. Belgian Congo.**—*M.R.*

8.10–16 551.510.535:551.557

Harang, L. and Pedersen, K., **Drift measurements of the E-layer.** *Geofysiske Publikasjoner*, Oslo, 19(10), **1956.** 30 p. 33 figs., 8 tables, 19 refs., numerous eqs. **DLC.** Also in *Journal of Geophysical Research*, 62(2):183–198, June **1957.** 15 figs., 2 tables, 13 refs., 3 eqs.—In this monograph, continuous records of drift of the diffraction pattern on the ground, due to reflections in the 100–160 km (E layer) height interval, at Kjeller, Norway (59°58′N, 10°06′E) from June 1953–Sept. 1955, using the Mitra method with 3 receiving points, are examined to show diurnal variations, fading period, effect of polarization, short time variations in drift directions (height, intensity and direction changes), measurement of drift from second order echoes, effects of solar eclipse of June 30, 1954, and the statistics of time shifts. Monthly seasonal and annual variation are compared with similar records from Ottawa, Washington and Cambridge. Prevailing drift is towards S.W. in winter and towards N.E. in summer. A solar 12-hour term appears at all seasons. During the eclipse, the critical frequency of the E layer decreased below 2 Mc/s and only E_s echoes were obtained (showing a reversal of drift). *Subject Headings:* **1. Ionospheric drift measurements 2. E layer winds 3. Sporadic E layer (E_s) drift 4. Eclipse effects on ionospheric drift 5. Kjeller, Norway.** —*M.R.*

8.10–17 551.575(471.1)

§*†Nurminen, Aili, **Some aspects of fog with special reference to South Finland.** *Suomalainen Tiedaekatemia, Helsinki, Toimituksia (Annales), Ser. A, I, Mathematica-Physica*, No. 218, **1955.** 80 p. 19 figs., 36 tables, 46 refs., eqs **DLC.** Also issued as reprint by *Helsinki. Universitet. Meteorologiska Institutet, Mitteilungen*, No. 77, 1956. **DWB, DLC**—This unusual monograph presents a systematic analysis of the annual, monthly, diurnal and spatial dis-

tribution of fog and the various meteorological factors in relation to the occurrence of fog, (or vice versa) at Helsinki Airport and nearby locations. The study is based on hourly observational data (6 a.m.–9 p.m.) from 1937–53. Ten years of around the clock hourly observations were available. Fog in relation to pressure, temperature, humidity and wind categories are tabulated in extended tables, and combinations of pressure and temperature and humidity and temperature with fog incidence also included. Effect of turbulence, elevation, snow cover, wind direction, air flow, temperature and humidity aloft, synoptic patterns, discontinuities, etc., are also considered. Finally, ceiling in fog and the effect of ice needles precipitating through fog on the dissipation of fog is considered. *Subject Headings:* **1. Fog climatology 2. Fog statistics 3. Helsinki Airport, Finland.**—*M.R.*

8.10–18 551.575 551.582.1(794)

†*Patton, Clyde Perry, **Climatology of summer fogs in the San Francisco Bay area.** *California. Univ., Univ. of California Publications in Geography*, 10(3):113–200, 1956. 34 figs., 24 tables, 32 refs. **DWB.** Review by David H. Miller in *Geographical Review*, 47(4):591–594, July 1957. **DLC**—This excellent monograph covers 1, the topography around San Francisco Bay; 2, the summer climate, general circulation of atmosphere in June, July and in Aug., variations in lapse rate, in moisture and in inversion base height content with different sources of air (Oakland), effect of ocean currents, precipitation, winds, temperature (effect of height and distance from ocean), humidity; 3, the causes and distribution of summer stratus, dissipation, distribution over land and over water, height variations, annual variations, diurnal variations; 4, effect of stratus or fog on temperature. This chapter represents an original approach to the study of stratus, and includes a number of charts and statistical analyses of temperature and cloud data at different distances up to 300 mi inland from the Golden Gate. Conclusion is that topography, advection of cold air, changes in air mass, shielding of solar radiation by stratus, and cold water area off coast are the important factors in determining the temperature in the area in summer. A cooling of 25°F due to advection may be accompanied by an additional cooling of 5°F due to shutting off of sunshine. Contrariwise, a great warming up when stratus clears may be due to change in wind to N. or N.E. (clear, dry air mass) rather than to the direct effect of sunshine. The effect of stratus on lag in "hottest" season from normal (July) to Sept. is discussed. Here again the predominance of continental winds may be the important factor rather than the lack of stratus in late summer. Effect of cold (upwelling) currents is also said to be exaggerated—it is the deep cool air masses from N. Pacific that are the important factor in causing stratus, not the surface cooling offshore. *Subject Headings:* **1. Summer climate of San Francisco Bay area 2. Fog climatology studies 3. California stratus 4. Stratus cloud effects on temperature 5. San Francisco Bay, Calif.**—*M.R.*

8.10–19 551.582.2(53)

†*Rathjens, Carl, Sr.; Rathjens, Carl, Jr.; Samlenski, E. and Kerner, G., **Beiträge zur Klimakunde südwest-Arabiens: Das Klima von Sana, das Klima von Jemen.** [Contribution to the climatology of southwest Arabia: the climate of Sana and the climate of Jemen.] *Hamburg. Seewetteramt, Einzel-veröffentlichungen*, No. 11, 1956. 37 p. 6 figs., 7 tables (some fold.), 76 eqs. **DWB**—Observations were made at a station erected in 1931 (by the senior author, who made 4 sojourns in the region) at Sana, capital of Yemen, located in a broad high valley at 2350 m (8000 ft) at 44°11′E and 15°23′N, on the S.W. corner of the Arabian Penninsula, not 100 mi from the Red Sea. The air and soil temperature, precipitation, humidity, wind, sunshine and cloudiness are analyzed and discussed on the basis of data for 1931–3. Then the climate of Yemen, from a geographers point of view, is discussed in general—circulation, rainy season, climatic zones (13) and, finally, the paleoclimate and historical climate. The tabular and graphical data are entirely for the city of Sana. The highest temperature reached at Sana was 30°C (86°F) and the lowest −5.8°C (22°F). At lower elevations extremes of 45.2°C (113°F) at Suakin on the west coast of the Red Sea (in the Sudan) compares with 105°F at Kamaran in Yemen. The latter place has a mean annual temperature of 30°C (86°F)—one of the warmest places on earth—mainly due to the small daily range in temperature, diurnal and seasonal. Rainfall is markedly seasonal—the few heavy showers come in northern winter and summer—the spring and autumn being rainless. Evidence of a much drier climate

in the past is noted—in spite of the abandoned wells, oases and farms which lead many to believe it is now drier than in the past. The explanation given for the depopulation is more economic (trade-routes no longer pass that way) than climatic. *Subject Headings:* **1. Climate of Yemen 2. Climate of Sana, Yemen 3. Climatic changes 4. Soil temperatures 5. Sana, Yemen 6. Yemen.**—*M.R.*

8.10–20 551.510.42:533.15

*Schmidt, F. H., **On the diffusion of stack gases in the atmosphere.** *Netherlands. Meteorologisch Instituut, Mededeelingen en Verhandelingen, (Ser. A)*, No. 68, **1957.** 60 p. 12 figs., tables, 20 refs., eqs. Price: F 5.00. **DWB, DLC** (QC851.N5)—In this neat monograph the problem of diffusion of stack gases into the atmosphere is considered as a combination of the problems of 1) the vertical propagation of heated jets in a stagnant environment; 2) the quasi-horizontal propagation of the jet by wind and 3) diffusion by turbulence. The integrated theory is worked out and then empirical nomograms are presented and discussed. Stability, influence of roughness (earth's surface) and of buoyancy are discussed in connection with meteorological applications and examples (London smog, Dec. 1952, etc.) giving numerical data. *Subject Headings:* **1. Stack effluent diffusion 2. Stack meteorology 3. Great London fog, Dec. 1952.**—*M.R.*

8.10–21 551.501.89:551.515.2

Senn, H. V.; Hiser, H. W. and Bourret, R. C., **Studies of hurricane spiral bands as observed on radar, Oct. 1–Dec. 31, 1956.** Miami, Univ. (of Coral Gables, Fla.). Marine Lab., Contract Cwb-9066, Final Report, Jan. **1957.** 22 p. 4 figs., 6 refs. **DWB**—Study of radar spiral precipitation bands in hurricanes indicates that a modified logarithmic formula for these bands must be used, since the logarithmic formula $\ln r = A + B\theta$, represents the pattern only at intermediate distance from the center—the "near" bands having crossing angles slightly lower, and the "far" bands having angles slightly higher than the average. The "near" bands were thus more nearly circular than the far. Precipitation bands are less affected by surface topography than are the surface winds, and correspond more nearly with winds at the 2500 ft level. *Subject Headings:* **1. Hurricane spiral bands on radar 2. Radar hurricane tracking.**—*M.R.*

8.10–22 551.576.1:629.135.2

Smith, T. B. and Diamond, R. J., **Studies of contrails from jet powered aircraft.** Meteorology Research, Inc., Pasadena, California, Contract AF 19(604)-1495, Final Report, Oct. 31, **1956.** 25 p. 31 figs., 13 refs., 4 eqs. **DWB**—A graphical and verbal analysis of photographic contrail data obtained from ground based cameras (20 power magnified) during 45 flights made on 33 days and involving 149 separate runs, between Feb. and June 1956 at Edwards Air Force Base, Fla., with 7 types of military jet aircraft. Results indicate that turbulent jet data can be used for calculating rate of spread of trail up to 400–1000 ft behind the engine. After about one minute the trailing vortex system changes into one of large unorganized eddies and the trail widens if conditions are right for persistence. Runs were mostly at 40,000–50,000 ft and with different power settings and heights within the critical contrail layer. Environmental temperature and pressure data were obtained from radiosonde flight. *Subject Headings:* **1. Condensation trail dispersion data 2. Jet aircraft contrail photographs 3. Edwards Air Force Base, Florida.**—*M.R.*

8.10–23 551.515.2(73)

†*U. S. Weather Bureau. National Hurricane Research Project, **Survey of meteorological factors pertinent to reduction of loss of life and property in hurricane situations.** A progress report of work accomplished under P.L. 71, 84th Congress, 1st Session. Its *Report*, No. 5, March **1957.** 87 p. tables, figs. Refs. at end of each ch. **DWB** (M15.2 U587m)—A detailed and systematic summary of the latest available knowledge on: 1) destructive force of hurricanes, 2) regional frequency of hurricanes, 3) damage producing characteristics of hurricanes 4) hurricane forecasting, 5) hurricane warnings and 6) hurricane surges. Analysis of data on frequency and damage pertains mainly to the coasts of the U. S. from Maine to

Texas. Tracks, frequency diagrams and much other illustrative material is included—much of it original. *Subject Headings:* 1. Hurricane damage 2. Hurricane frequency 3. Hurricane forecasting 4. Hurricane warnings 5. Hurricane surges 6. East Coast, United States. —*M.R.*

8.10–24 551.521.4:551.594.5

*Vegard, L., **Composition, variations and excitation of auroral luminescence spectra.** *Geofysiske Publikasjoner*, Oslo, 19(9), 1956. 51 p. 13 figs., 4 plates, 18 tables, 71 refs. DLC—This monograph contains an elaborate analysis of auroral spectrograms obtained with a "V" and a "F" spectrograph at Tromsö Observatory during 1951/52 and 1952/53. Wave length and intensity measurements, groups of auroral features, verification of atomic line interpretation, auroral lines observed by other scientists, problems of analysis, band systems present, Doppler displacement and proton velocities and temperature measurements of "V" spectrographs; and latitude and altitude effects of proton flux (and of H-lines), spectrograms of pulsating and red auroras, correlation between intensity variations of Forbidden NI lines and proton flux and ionospheric temperature determinations by means of the N_2^+ IN bands, are discussed with data and spectrograms presented in profusion. *Subject Headings:* 1. Auroral luminescence spectra 2. Auroral F spectrograms 3. Auroral spectrograms 4. Tromsö, Norway.—*M.R.*

8.10–25 551.509.5:551.547.1

*White, Robert M., **Preparation of extended forecasts of the pressure height distribution in the free atmosphere over North America by use of empirical influence functions.** *U. S. Air Force, Cambridge Research Center, Air Force Survey in Geophysics*, No. 68, May 1955. 47 p. 4+14 figs., 19 tables (fold.)+4 tables, 6 refs., 9+17 eqs. DLC—This report explains the use of "empirical influence functions" in forecasting heights of pressure surfaces at the 1000, 500 or 200 mb levels for 24, 72 or 120 hrs in advance, without preparing analyzed synoptic charts as a preliminary step but directly from the teletype data for a network of 15 radiosonde stations in North America. The actual tables (appended) are based on relationships of pressure heights at 45 points to contour heights at a given point in the upper atmosphere, and are in the form of simple weighting or influence functions based on statistical analysis of past data for the continent. Accuracy in practice (winter 1953–4) is comparable to current methods and is greater in East than West side of continent. The forecasts were more accurate for high than low elevations because surface disturbances are often shallow and local. Five-day forecasts were next to useless, but data are included nevertheless for 120 hrs. Theory, network, use of tables and an article to be published in Journal of Meteorology are included in report. This gives theory and results of 125 independent forecasts. *Subject Headings:* 1. Pressure height forecasts 2. Empirical influence functions 3. Extended forecasting 4. Objective contour height forecasting 5. North America. I. Palson, William C.—*M.R.*

8.10–26 551.515.8:551.509.317(47)

†Zubian, Gevorg Davidovich, **Sinoptiko-aerologicheskoe issledovanie atmosfernykh frontov.** [Synoptic-aerological research on atmospheric fronts.] Leningrad, Gidrometizdat, 1955. 120 p. 60 figs., 6 tables, 52 refs., 16 eqs. DLC —A well compiled and arranged series of studies on various aspects of fronts of all types—their vertical and horizontal structure, the temperature, humidity, pressure and cloud fields in and near fronts, as exemplified by numerous actual surface and upper level synoptic charts, cross-sections, schematic diagrams, etc. A good bibliography of recent Russian literature on synoptic meteorology (up to 1954) is included. Dynamic considerations in frontogenesis and frontolysis, stratospheric relation to fronts, vertical motions and weather in the East European area are considered. *Subject Headings:* 1. Fronts 2. Synoptic case histories 3. Synoptic meteorology of Eastern Europe 4. U.S.S.R. —*M.P.*

TRANSLATIONS

See: Aviation medicine, 8.10; Auroral spectra (Bagariatskii, Fedorova), 8.10–299.

GENERAL GEOPHYSICS AND METEOROLOGY

ARCTIC RESEARCH

See also: **Arctic res.**, 8.10–1; **Climate of Arctic Ocean** (Herrmann), 8.10–6.

8.10–27 551.589

§*Hare, F. K.; Godson, W. L.; MacFarlane, M. A. and Wilson, C. V., **Specification of pressure fields and flow patterns in polar regions: theories and techniques.** McGill Univ. Arctic Meteorology Research Group, Contract AF 19(604)-1141, Scientific Report, No. 3; Publication in Meteorology, No. 5, Jan. 1957. 11 figs., numerous tables and eqs., 14 refs. **DWB** (919 M 145s)—This report consists of 3 papers: I. **The quantitative specification of the North Polar pressure field: mathematical techniques,** by F. K. Hare; II. **The numerical representation of atmospheric flow pattern in Polar areas,** by W. L. Godson; and III. **Working procedure for specification of pressure surfaces,** by M. A. MacFarlane and C. V. Wilson. The first discusses the mathematical techniques with respect to the Polar area (above 45° lat.) with the coordinates, fitting procedures and method of orthogonal polynomials examined at some length; the 2nd paper applied the method to the particular case of the North Polar area (modified cylindrical co-ordinates); and the 3rd paper applies the method to specification of pressure fields for 4 specific 500 mb pressure situations—two of which are 5-day mean pressure (height) maps. The techniques used follow after those outlined by G. P. Wadsworth et al. (1948) and R. G. Miller and T. Malone (1956). *Subject Headings:* **1. Arctic synoptic climatology 2. Synoptic analysis 3. Pressure field specifications 4. Arctic.**—*M.R.*

8.10–28 551.547.3

Heastie, H., **Average height of the standard isobaric surfaces over the North Polar regions in July.** *Meteorological Magazine*, London, 86(1021):198–202, July 1957. 4 figs., 6 refs. **DWB**—Charts of average height of standard isobaric surfaces over area from North Pole to 55°N in July were given in *M.R.P.*, 981, 1956 (*see* 8.1–255, Jan. 1957, *MAB*). This article gives for July 1949–53 500 mb and 100 mb contours, 700–300 and 200–100 mb thickness lines with a brief discussion. *Subject Headings:* **1. Upper air pressure variations 2. North Polar regions.**—*C.E.P.B.*

8.10–29 551.577:551.573(26)

Timofeev, V. T. (*Cent. Inst. Northern Sea Route, Leningrad*), **O godovom balanse vod Severnogo Ledovitogo okeana.** [Annual water balance of the Arctic Ocean.] *Priroda*, Moscow, No. 7:89–91, July 1956. map, 2 tables. **DWB, DLC**—Results of calculations of the annual water balance of the Arctic Ocean, carried out at the Arctic Scientific Research Institute of the Northern Sea Route in Leningrad, in which the inflow and outflow of waters through the Faeroe and Shetland Islands and Danish and Bering Straits and the continental runoff were taken into account. It is shown that there is a surplus of 31,400 km³ of inflowing waters into the ocean which must be annually carried away from the Arctic Ocean through the numerous straits of the Canadian Arctic Archipelago. *Subject Headings:* **1. Water balance of oceans 2. Arctic Ocean.**—*A.M.P.*

8.10–30 551.577.36/7(98)

†U. S. Weather Bureau and U. S. Corps of Engineers, **Rainfall intensities for local drainage design in Arctic and Subarctic regions of Alaska, Canada, Greenland and Iceland for durations of 5 to 240 minutes and 2-, 5-, 10-, 20-, and 50-year return periods.** Wash., D. C., Sept. 1955. 13 p. 7 figs., 3 tables, 19 refs. **DWB**—Data for rainfall intensity-duration-frequency calculations for airport drainage design are provided in a form similar to that for U. S. and North Africa coastal regions which were included in the first 3 reports of this series. Since basic data for Arctic America are sparse, a method of estimating short duration rainfall, based on thunderstorm incidence, and the mean of the maximum daily rainfall observed in years is designed. From charts and curves the 2-year, one hour rainfall expectancy can be deduced for the several areas and, finally, the intensity for any duration from 0–60 min and 60–240 min for one hour rates from 0.2 to 2.0 in.; methods are explained in detail. Data from about 250 stations

with 15 years or more record were used. *Subject Headings:* **1. Rainfall intensity duration data 2. Alaska 3. American Arctic 4. Greenland 5. Iceland. I. Wilson, Walter T.**—*M.R.*

ANTARCTIC RESEARCH

See also: **Pressure variations, Antarctic** (Schwerdtfeger, Prohaska), 8.10–178.

8.10–31 551.555.4

Ball, F. K. (*Div. of Met. Physics, C.S.I.R.O., Melbourne, Australia*), **Katabatic winds of Adélie Land and King George V Land.** *Tellus*, Stockholm, 9(2):201–208, May **1957.** 3 figs., 10 refs., eqs. **DLC**—The principal features of the katabatic wind in the neighbourhood of Commonwealth Bay, Antarctica, are described with particular emphasis on the sudden onsets and cessations of the wind. The unusual features are explained on the hypothesis that a quasistationary pressure jump line, forming a sharp boundary between the strong katabatic winds of the ice slope and comparitively calm conditions over the sea, occurs near the coast. Movement of this pressure jump line across the coast causes a sudden change in wind conditions there. Quantitative predictions on this hypothesis are of the correct magnitude. *Subject Headings:* **1. Katabatic winds 2. Adélie Land 3. George V Coast 4. Antarctica.**—*Author's abstract.*

8.10–32 551.582.2(94) 551.501.9(99)

*Law, P. G. and Burstall, T., **Heard Island:** *Australian National Antarctic Research Expeditions, Interim Reports*, No. 7, May **1953.** 32 p. 12 plates (photos), 7 tables, 28 refs. **DWB**—Included in this monograph describing the discovery, geography, research station set up by the ANARE (Australian Nat. Antarctic Res. Est.), geology, biology, geomagnetism and seismology of Heard Island (53°S, 73½°E in Southern Indian Ocean, about 2400 naut mi S.W. of Western Australia, 2300 from S. Africa, and 900 N. of Antarctica is a discussion of the climate and meteorology (p. 22–28), cosmic rays (p. 29–30) and auroras (p. 30). The research station was established Dec. 11, 1947 and has 6 years of steady operation, manned by 14 men who serve 12 month tours (1 meteorologist and 3 observers). Station, facilities and operations are illustrated. Tables include for each month of 1948, 1949 and 1950 the mean pressure, temperature, dew point, maximum and minimum and extreme maximum and minimum temperatures, precipitation, sunshine hours and wind in 24 hours. *Subject Headings:* **1. Climate of Heard Island 2. Antarctic research stations 3. Heard Island 4. South Indian Ocean.** —*M.R.*

IGY, WMO

See also: **IGY satellite program,** 8.10–52.

8.10–33 550.3:061.3

Day, Sir Archibald, **Some organizational aspects of the International Geophysical Year.** *Institute of Navigation, London, Journal*, 10(3):249–253, July **1957.** ref. **DWB**—General report on organization and administration of IGY. The total cost will be about £1 million, financed by national committees. *Subject Heading:* **1. International Geophysical Year, 1957–1958.**—*C.E.P.B.*

8.10–34 551.5:061.3

World Meteorological Organization, **International Geophysical Year, 1957–1958, Meteorological programme: general survey.** Its *WMO* (Publication), No. 55. IGY.1, **1956.** 111 p. forms. **DWB, DLC**—The history, aims and details of the International Geophysical Year program, especially in meteorology, are reviewed in this systematic brochure, for the benefit of all WMO participants and of those in other disciplines who want to know more about the Meteorological program. The investigations, networks, codes, etc. in synoptic and dynamic meteorology, surface and upper air, physical meteorology, radiation, ozone, atmospheric electricity, sferics, tropospheric properties, radioactivity in the atmosphere, chemical composition of atmosphere and precipitation, etc; synoptic, upper air and other networks, geographical networks, weather central in Antarctic, codes, gaps, publications, committees, and panels, telecommunication, world meteorological data center, forms, charts, etc. numerous annexes

give further details. *Subject Headings:* **1. IGY meteorological program 2. WMO participation in IGY.**—*M.R.*

CONFERENCES

See also: **Met. conference, W. Germany** (Flohn), 8.10–41; **Conf. on principles of environmental stress on soldiers . . .** (U. S. Quartermaster Corps.), 8.10–276.

8.10–35 551.586(213)

Problems of tropics studied at Ceylon. *American Meteorological Society, Bulletin,* 37(4): 171, April 1956. **DWB, DLC**—The conference held in Ceylon in March 1955 under the auspices of UNESCO dealt with tropical vegetation and humid tropics research. It was attended by delegates from Asiatic and European countries and the U. S. *Subject Headings:* **1. Humid tropics research 2. Tropical vegetation 3. Conferences.**—*I.L.D.*

OBSERVATORIES

See also: **Mt. Washington Obs.** (Brooks), 8.10–44.

8.10–36 551.501.9(47)

Buchinskiĭ, I. E., **Sto let Kievskoĭ meteorologicheskoĭ observatorii.** [One hundred years of the Kiev Meteorological Observatory.] *Vsesoiuznoe Geograficheskoe Obshchestvo, Leningrad, Izvestiia,* 88(4):390–392, July/Aug. 1956. **DLC**—The Kiev meteorological observatory was founded in 1855, but meteorological observations were first begun in the Ukraine in 1770 by the physician I. Lerkhe. The history of meteorological observations in the Ukraine since 1770, the founding of the Kiev meteorological observatory, the names of its directors, its activities and various publications up to the present are summarized. *Subject Heading:* **1. Kiev Meteorological Observatory.**—*I.L.D.*

8.10–37 551.501.9:551.43(742)

*Cook, S. F. and Pace, Nello (*School of Medicine, Univ. of Calif., Berkeley*), **White Mountain high altitude research station.** *Science,* 116(3026):697–700, Dec. 26, **1952.** 3 figs., refs. **DWB**—Site and equipment of the station (comprising two installations, one at 10,600, the other at 12,500 feet, with the summit at 14,250 readily accessible) are described. Data on temperature, pressure, humidity and wind at 10,600 ft are presented for the period 1948–1952. Physical and biological research facilities, which are now generally available to investigators, are specified. *Subject Headings:* **1. High altitude research stations 2. Climatic data 3. White Mountains, New Hampshire.**—*G.T.*

8.10–38 522.1:621.396.8

Ryle, M., **The Mullard Radio Astronomy Observatory, Cambridge.** *Nature,* London, 180(4577):110–112, July 20, **1957.** 4 figs., 3 refs. **DWB**—Description of a new observatory being erected 5 mi S.W. of Cambridge, Eng. as part of Cavendish Laboratory. It will consist of a number of specialized instruments, each designed to investigate a particular type of problem. *Subject Headings:* **1. Radio observatories 2. Mullard Radio Astronomy Observatory, Cambridge, Eng.**—*C.E.P.B.*

SERVICES AND SOCIETIES

See also: **A.M.S. statement on weather modification,** 8.10–118; **Report of AGU Comm. on Runoff** (A.G.U.), 8.10–248.

8.10–39 551.5:061.1

Organization of the Meteorological Office. *Nature,* London, 180(4579):223, Aug. 3, **1957. DWB**—In the House of Commons on June 28 the Secretary of State for Air said the Brabazon Committee thought the decision to entrust the Meteorological Service to the Air Ministry in 1919 was wise. The new organization (2 divisions—forecasting and services, and research, under a Director-General) is described. The Meteorological Committee would also be revised. *Subject Heading:* **1. British Meteorological Office.**—*C.E.P.B.*

8.10–40 551.5(09) 551.508

Fletcher, Robert D. (*Pres. Amer. Met. Soc.*), **Progress during 1956 in American meteorology.** *Weatherwise*, Boston, 10(1):3–7, Feb. **1957.** fig., 2 photos. **DWB, DLC**—Progress in the U. S. during 1956 has been mainly along lines of equipment and organization; higher radiosonde ascents, better landing aids (visibility, ceiling, fog dissipation, atmospheric conductivity, radar networks), better weather reconnaissance planes and equipment (WB50's which have range of 3200 naut mi and 30,000 ft cruising altitude and automatic Doppler-radar navigating equipment); an automatic weather station network (7 stations), ship reporting network improvement, "Weather-vision"—and Air Weather Service television reporting system, and other research and data gathering projects. Weather forecasting improvement through use of IBM computers, data processing, governmental and society activities are reviewed. *Subject Headings:* **1. Progress in meteorology 2. Meteorological equipment improvement.**—*M.R.*

8.10–41 551.5:06(04)

Flohn, Hermann, **Begrüssungsansprache des 1. Vorsitzenden.** [Address of welcome of the first chairman.] *Germany. Deutscher Wetterdienst, Berichte*, No. 22:5–6, **1956. DWB, DLC**—In his welcoming address the speaker lists the names of the foreign guests and discusses the program of the meeting, some of the more important problems to be treated and the present trend in meteorology, the present situation of the West German Meteorological Service, etc. *Subject Headings:* **1. Addresses 2. Meteorological conferences.**—*I.L.D.*

8.10–42 551.5(0)

Fletcher, Robert D. (*Pres. of A.M.S.*), **The AMS publications program.** *American Meteorological Society, Bulletin*, 38(4):191–192, April **1957. DWB**—In addition to the already aggressive publications program of the A.M.S. (the **Journal, Bulletin, Weatherwise, Monographs** and **Abstracts and Bibliography,** and the **Compendium, Glossary** and other monographic publications) the council is considering ways of making more applied meteorology material available to the public, and has begun a series of statements (e.g. on long range weather forecasting, weather modification and radioactive fallout) and is planning a series of surveys in various narrow fields of meteorology, to be published in the **Bulletin.** *Subject Heading:* **1. American Meteorological Society publications.**—*M.R.*

8.10–43 551.5:61.2

Sutcliffe, R. C., **An outlook on meteorology and the Society.** *Royal Meteorological Society, Quarterly Journal*, 83(357):285–289, July **1957. DWB**—A general article reviewing the progress of meteorology in the past 30 yrs and the prospects for the future. Before the war there were large gaps in our knowledge, but since the war these are rapidly being filled in. The atmosphere above 20 km is of special interest, but much of it tends to be divorced from meteorology and has been termed "aeronomy." *Subject Headings:* **1. Progress in meteorology 2. Royal Meteorological Society.**—*C.E.P.B.*

EDUCATION, HISTORY AND BIOGRAPHY

HISTORY

See also: **Hist. of forecasting** (Wehner, Ziemann), 8.10–13; **Hist. of Kiev Met. Obs.** (Buchinskiĭ), 8.10–36; **Hist. of photogrammetry** (Koschmieder, Meyer), 8.10–222.

8.10–44 551.501.9(744)

Brooks, Charles F. (*Pres. Mt. Wash. Obs.*), **The Mt. Washington Observatory.** *Weatherwise*, Boston, 9(5):151–154, Oct. **1956.** 2 photos, table. **DWB**—The history, directorship and activities of the Mt. Washington Observatory and its staff (with brief tables giving monthly temperature, precipitation, wind, and cloud averages, extremes and frequencies) are discussed and illustrated. Many important projects in cloud physics, icing, cosmic rays, aerodynamics, snow crystals and cloud seeding are underway, in addition to routine synoptic observations

which supplement rawinsonde data from nearby stations. *Subject Headings:* **1. Mt. Washington Observatory 2. Mountain meteorology 3. Mt. Washington, N. H.**—*M.R.*

TERMINOLOGY

8.10–45 532.593:550.34:495.6

Darbyshire, J. and Ishiguro, S., **Tsunamis.** *Nature*, London, 180(4577):150, July 20, **1957. DWB**—Tsunami is a Japanese word derived from the Chinese and meaning a harbor wave. *Subject Headings:* **1. Tsunamis 2. Japanese language.**—*C.E.P.B.*

8.10–46 551.510.53:001

Flohn, Germann, **Bemerkung zur Frage der Nomenklatur der Atmosphäre.** [Problem of the nomenclature of the atmosphere.] *Germany. Deutscher Wetterdienst, Berichte*, 4(22): 85–86, **1956.** 2 figs., 8 refs. **DWB, DLC**—The author criticizes the IGY classification of the atmosphere, which assumes the existence of a separation between the stratosphere and mesosphere after reviewing evidence showing that in most of the atmosphere there is no separation between stratosphere and mesosphere and that in middle latitude there is a gradual transition above 40 km, but no stratopause. The author proposes to extend the stratosphere up to the temperature maximum at about 40 km. *Subject Headings:* **1. Atmospheric nomenclature 2. Stratosphere 3. Mesosphere.**—*I.L.D.*

BIOGRAPHY

8.10–47 551.5:92

Gold, E., **[Obituary of] Ernest George Bilham, B.Sc., D.I.C.** *Meteorological Magazine*, London, 86(1021):193–194, July **1957. DWB**—Born Dec. 1, 1891, died May 5, 1957. Joined Meteorological Office April 1915. After a year at Kew Observatory, a year with W. H. Dines at Benson, and 7 yrs as a forecaster at H.Q., served 6 yrs as Superintendent of Instruments, 8 yrs Superintendent of Climatology and 14 yrs as Head of Forecast Division. *Subject Headings:* **1. Obituaries 2. Bilham, E. G.**—*C.E.P.B.*

8.10–48 551.5:92

Feld'man, Ia. I., **Evgraf Evgrafovich Fedorov (k 75-letiiu so dnia rozhdeniia).** [E. E. Fedorov (on his 75th birthday).] *Meteorologiia i Gidrologiia*, Leningrad, No. 3:60–61, March **1956.** port. **DWB, DLC**—E. E. Fedorov was born in 1880, son of the distinguished crystallographer Evgraf Stepanovich Fedorov. A brief account of his academic career and of his achievements in meteorology and climatology is given. *Subject Headings:* **1. Biography of E. E. Fedorov 2. Fedorov, E. E.**—*I.L.D.*

8.10–49 551.5:92

Egor'eva, A. V., **100 let so dnia rozhdeniia IU. M. Shokal'skogo.** [100th anniversary of the birth of IU. M. Shokal'skiĭ.] *Priroda*, Moscow, 46(2):105, Feb. **1957. DLC.** Article with same title in *Meteorologiia i Gidrologiia*, No. 10:70, Oct. **1956. DWB, DLC**—Born in Oct. 1856, Shokal'skiĭ contributed to the development of oceanography, meteorology, polar science and cartography. Author of **Oceanography.** Lists titles of papers on the present state of investigations in these fields which were read at the anniversary celebration. *Subject Headings:* **1. Biography of Shokal'skiĭ. I. Shokal'skiĭ, IU. M.**—*A.A.*

8.10–50 551.5:92

Ashford, O. M., **[Obituary of] Dr. Gustav Swoboda.** *Royal Meteorological Society, Quarterly Journal*, 83(357):414, July **1957. DWB.** For other obituaries *see*: **[Obituary of] Dr. Gustav Swoboda.** *Yugoslavia. Hidrometeoroloska Služba, Vesnik*, 5(3/4):132, July/Dec. **1956. DWB.** Aujeszky, L., **Gustave Swoboda 1893–1956 [Obituary].** *Időjárás*, Budapest, 60(5):322–323, Sept./Oct. **1956.** Bilancini, R., **Nota commemorativa [of] Gustav Julius Swoboda.** *Rivista de Meteorologia Aeronautica*, Rome, 17(2):63, April/June **1957. DLC**—Born Sept. 7, 1893. Pursued new ideas on frontal theory of Bergen school. In 1938 became executive head of IMO (later WMO). Retired 1955, died Sept. 4, 1956. (*See also* 8.2–33, Feb. 1957, *MAB.*) *Subject Headings:* **1. Obituaries 2. Swoboda, G.**—*C.E.P.B.*

PRACTICAL AND APPLIED METEOROLOGY

ASTRONAUTICS—SATELLITE OBSERVATORIES

8.10–51 629.19

Ehricke, Krafft A. (*Convair, Div. of General Dynamics Corp., San Diego*), **Astronautical and space-medical research with automatic satellites.** *Franklin Institute, Phil., Journal Monograph*, No. 2:25–68, June **1956.** 25 figs., 2 tables, 8 refs., 20 eqs. **DWB**—Recent advances in the field of astronautics including "technological satellites" and "biosatellites," energy requirements; accuracy, tracking and data transmission requirements and recovery problems are set forth in this detailed article. The necessary nomograms and diagrams are provided for evaluating the various factors for flight to the moon, Mars, Venus or the sun and return, with manned and unmanned vehicles. Hyperbolic satellites for obtaining information from the moon, Mars and Venus are also discussed. *Subject Headings:* **1. Astronautics 2. Satellite observatories 3. Biosatellites.**—*M.R.*

8.10–52 551.507.36:629.19

Larger orbit for satellite. *Science*, Wash., D. C., 124(3217):359, Aug. 24, **1956. DWB, DLC**—Improved performance of launching vehicle for IGY satellite leads to estimate that a final velocity of 19,000 mph (instead of a mere 18,000 mph) and a maximum distance of 1500 mi (instead of 800 as predicted) may be attained. *Subject Headings:* **1. Satellite orbits 2. IGY satellite program.**—*M.R.*

8.10–53 551.507.36:629.19

Thiruvenkatachar, V. R. (*Inst. of Armament Studies, Kirkee*), **An artificial satellite for the earth.** *Journal of Scientific and Industrial Research, Sec. A*, New Delhi, 15(2):61–63, Feb. **1956.** 6 refs. **DWB, DLC**—Nature, orbit, launching and scientific uses (astronomy, geodesy, meteorology, etc.) of an earth satellite such as is being developed for use during IGY is described at some length. *Subject Heading:* **1. Satellite observatories.**—*M.R.*

8.10–54 551.507.36:551.521:551.524

Goldman, D. T. and Singer, S. Fred (*both, Md. Univ.*), **Studies of a minimum orbital unmanned satellite of the earth (MOUSE), Pt. 4, Radiation equilibrium and temperature.** *Maryland. Univ. Physics Dept., Technical Report*, No. 46, June **1956.** 31 p. 12 figs., 2 tables, 16 refs., numerous eqs. (*See* 7.11–123, Nov. 1956, *MAB*, for Pt. 1 and 8.7–84, July 1956, *MAB* for Pt. 2.) **DWB**—Nomograms and tables are presented for calculating the temperature and heat exchange of a satellite, based on the latest literature (which is amply cited) on radiation from sun, reflected from earth and long wave radiation from earth. The albedo and thermal properties of the satellites own skin and its interior are important factors. Meteors, cosmic rays, collisions, etc. are also involved. *Subject Headings:* **1. Satellite temperature calculations 2. Radiation equilibrium of MOUSE.**—*M.R.*

AERONAUTICAL METEOROLOGY

See also: **Aviation medicine,** 8.10–2; **Fog at Helsinki Airport** (Nurminen), 8.10–17; **Contrails from jet planes** (Smith, Diamond), 8.10–22; **Aircraft weather reconnaissance** (Schaefer, Taylor), 8.10–86; **High level turbulence** (Farthing), 8.10–185; **Project Cloud Trail** (U.S.A.W.S.), 8.10–227; **Flying weather data** (Potter), 8.10–281

8.10–55 551.551.5

§*Rohan, P. K., **Investigation into turbulence reported by aircraft over the eastern North Atlantic.** *Eire. Meteorological Service, Technical Note*, No. 22, March **1957.** 16 p. 4 figs., 9 tables, 11 refs. **DWB**—Turbulence reports obtained during Oct. 1953–Sept. 1954 over the eastern North Atlantic at heights up to 25,000 ft are analyzed for intensity, location, air mass position, time of day, height, season, type of aircraft, cloud conditions, associated icing, etc. A total of 37,746 aircraft reports received at Shannon from the ocean area west of Shannon-Prestwick were scanned. About 1% of these (366) showed some turbulence. This is thought

to be an understatement of the actual number of cases, since a no turbulence report does not signify lack of turbulence, and a pilot may not report it if busy or if accustomed to more severe turbulence, or if it is of brief duration. Also planes avoid areas of turbulence, both horizontally and vertically. Turbulence was reported on 28 days in Sept. 1954—2.63% of cases, and on 9 days in May and June (0.3%). Sept. 1954 was an unusually bad month over the N. Atlantic. About $\frac{1}{3}$ of the cases of turbulence were associated with icing (121 cases), and the greatest proportion (37%) were in cold air masses (4 other air masses accounted for the remaining 62%). A significantly higher percent of cases occurred with DC-6 aircraft than with other types—however the DC-6 operated more frequently in the 10,000–16,000 ft range than did other types. Likewise westbound flights reported more turbulence than eastbound and this too is due to the lower flying levels chosen by westbound flights (to avoid high winds from westerly quadrant). No turbulence was recorded in occlusions or warm air masses. No connection was found between turbulence and vorticity (cyclonic, anticyclonic or zero). At least 71 cases (20%) of all turbulence reports were in clear air at heights from 6–21 thousand feet. Most cases occurred on the low pressure (cold) side of the jet stream, and with uniform flow of 25–100 km. (Data used in this report are the same as those used by the author et al. in *Technical Note*, No. 21 of the same series.) Surface and 500 mb synoptic charts for Sept. 29, 1954 show positions and character of turbulence reports for 0000 and 0300Z over N. Atlantic. Basic data are shown on grid of 1° squares of latitude and longitude and in tables. *Subject Headings:* **1. Turbulence reports from aircraft 2. Turbulence-aircraft icing relationships 3. Clear air turbulence 4. Northeastern Atlantic.**—*M.R.*

8.10–56 / 551.589.5:656.71(512.317)

*Baker, E. T. and Hughes, R. G. (*both, British Met. Off.*), **An analysis of low cloud and poor visibility at Sek Kong, May 1951 to April 1955.** *Hong Kong. Royal Observatory, Technical Note*, No. 16, May **1956.** 94 p. fig., 88 tables. **DWB**—Extensive tables give for each month the frequency of morning, afternoon and daylight hours visibility and ceiling data for each year from 1952–1955 at Sek Kong airport and for period as a whole. Average duration of spells of low cloud and poor visibility, number of spells and longest spell (in hours) are included in tabulation. In addition, summaries of conditions during the year, each season and each month are given in text, with brief tables showing hourly frequencies of bad weather. *Subject Headings:* **1. Ceiling and visibility data 2. Sek Kong Airport, Hong Kong.**—*M.R.*

8.10–57 656.7

Durst, C. S., **The problem of aircraft separation over the Atlantic.** *Institute of Navigation, London, Journal*, 10(3):254–263, July **1957.** 3 figs., 7 tables, eqs. **DWB**—Chances that two aircraft which believe they are flying parallel l miles apart, are actually only $\frac{1}{2}$ mi apart, and standard error off track in mid-Atlantic, are calculated. Worst is winter at 300 mb. Distance apart of paths to give a 1–5 million chance of collision without avoiding action is calculated; it can be diminished by uniform wind forecasting. *Subject Heading:* **1. Aerial navigation.**—*C.E.P.B.*

8.10–58 551.55:629.13

Powell, P. G., **Route analysis and flight planning with isotachs.** *Institute of Navigation, London, Journal*, 10(3):264–270, July **1957.** 7 figs. **DWB**—An account with illustrations is given of two new templates developed by Trans-Canada Air Lines. The route analysis template consists of a circle of radius true air speed and a wind speed slot. Plotting instructions are given. The flight planning template consists of concentric wind circles every 10 kn (1 in.=100 kn) and arcs of airspeed circles radius 250 kn/20 mi. This gives flight time. *Subject Headings:* **1. Flight planning 2. Isotachs 3. Trans-Canada Airlines.**—*C.E.P.B.*

8.10–59 551.509.58:656.71

Proctor, J. D., **Landing forecasts for London Airport.** *Institute of Navigation, London, Journal*, 10(3):291–299, July **1957.** 5 figs., 3 tables. **DWB**—Describes an investigation into operational accuracy of TAF's. Actual weather (runway visual range RVR and cloudbase) was compared with TAF at 15 min intervals, London Airport 1955. Cost of diversions is balanced against saving. *Subject Heading:* **1. Airport landing forecasts.**—*C.E.P.B.*

AGRICULTURAL METEOROLOGY

See also: **Frost resistant crops** (Efimov), 8.10–168; **Soil moisture effects on plants** (Wadleigh), 8.10–255.

8.10–60 551.509.62:551.524.35

Gol'tsberg, I. A., **Zashchita sel'skokhoziaĭstvennykh kul'tur ot zamorozkov.** [Protection of crops against frosts.] *Meteorologiia i Gidrologiia*, No. 7:3–7, July **1955.** fig., 2 tables, 5 refs. **DWB, DLC**—Beginning with a brief discussion of the fact that minimum temperature recorded at ground level may be considerably lower than those recorded in the usual instrument shelter and the conditions leading to such deficiencies in continental regions and pointing out that even during the frost free period (as recorded by the temperature in the instrument shelter) ground frosts may occur, the author investigates the length of the frost free period for various crops in the Kokchetav Oblast; which is representative of the areas in the U.S.S.R. that are being brought under cultivation. Data on the duration of the frost free period in the air, the ground and at the ground surface as a function of the mean duration of the frost free period in the air, the mean frost free period for individual crops are presented. Various measures employed to protect crops against frost in the U.S.S.R. are considered and a schematic map showing the diverse measures used to protect plants against frost in the different climatic regions of the U.S.S.R. is reproduced. *Subject Headings:* **1. Frost protection 2. Frost free period 3. Kokchetav Oblast, U.S.S.R.**—*I.L.D.*

8.10–61 551.509.62:634.3

Krasikov, P. N. and Smirnov, N. S., **Primenenie dymov dlia zashchity tsytrusovykh kul'tur ot zamorozkov.** [Utilization of smoke to protect citrus plants against frost.] *Akademiia Nauk SSSR. Geofizicheskiĭ Institut, Trudy*, No. 23(150):134–151, **1954.** 9 figs., 8 tables, 10 refs., 6 eqs. **DLC**—On the basis of Soviet studies on the use of smoke in protection against frost and personally conducted experiments with red phosphorus as a smoke producer the author discusses the advantages and deficiencies of smoke screens, the heat protective action of smoke, the smoke from red phosphorus as a means of combating frosts and the execution and results of experiments on smoke production with red phosphorus. A diagram of the experimental plot, photographs of the smoke pots and of its operation and temperature data obtained in the smoke experiments are presented. *Subject Headings:* **1. Smudging of orchards 2. Frost protection 3. U.S.S.R.**—*I.L.D.*

8.10–62 551.524.36:635.64(47)

Pobetova, T. A., **Teploobespechennost' pomidorov na Evropeĭskoĭ territorii SSSR.** [Heat supply for tomatoes in the European U.S.S.R.] *Meteorologiia i Gidrologiia*, No. 4:37–41, April **1956.** 3 figs., 4 tables, 4 refs. **DWB, DLC**—Using agroclimatic data from Torzhok (Kalinin Oblast) and Gorkii (Moscow Oblast) the author presents graphic and tabular data and discussion of the following: heat requirement (degree days) from the time of planting to harvesting of flesh colored ripe tomatoes, heat requirement from time of planting to harvesting of green-flesh ripe tomatoes, frequency (%) of sums of effective temperature exceeding 15°C per year, requirement (%) of temperature sums exceeding 15°C per individual years, requirement (%) of temperature sums of 100, 200, 300°C and dates of planting of tomato shoots. Also a map showing isolines of heat requirements of tomatoes in European U.S.S.R. is presented. *Subject Headings:* **1. Degree-day data 2. Tomato crops 3. U.S.S.R.**—*I.L.D.*

FOREST METEOROLOGY

8.10–63 551.501:551.579:632.187

Anderson, Henry W., **Detecting hydrologic effects of changes in watershed conditions by double-mass analysis.** *American Geophysical Union, Transactions*, 36(1):119–125, Feb. **1955.** 4 figs., table, 12 refs. **DWB, DLC**—By use of the "double-mass analysis" method of adjustment, it was shown that the precipitation effectiveness [storm intensity (P)] and antecedent precipitation for 21 days (aP) plotted cumulatively against peak discharge of each year (1931–1947) is inconsistent but roughly parallels the fire history of the watershed (large fires occurred in 1932 and 1933, devastating 31% of the watershed). The change in the peak discharge

(slope) began 2 years after the fires. Nearby catchments not burned over did not show the inconsistency in double-mass curve that the Santa Ynez curve showed. Control test was made using precipitation records for Juncal raingage, which proved consistent in time for 1931–1944. Six other gages also showed time-consistency. The study was made on the Santa Ynez River Watershed, Calif. (Gibraltar Reservoir for Santa Barbara). It is concluded that the double-mass technique can detect changes in peak discharge, annual total discharge and reservoir sedimentation before and after large fires in a watershed. Discharge is increased after fires and recovers to normal rates after brush cover is restored. *Subject Headings:* **1. Forest fire effects on runoff 2. Double mass technique 3. Santa Ynez Watershed, Calif.**—*M.R.*

8.10–64 625.7:551.577

Friedrich, W. (*Vienna*), **Das Autobahnprojekt und die Witterungsverhältnisse im Wienerwald.** [The express highway project and weather conditions in the Vienna woods.] *Wetter und Leben*, Vienna, 7(8/11):203–205, **1955.** 2 figs. **DLC**—The express highway as it is extended towards Vienna crosses different elevations in the Vienna woods so that varying temperature and precipitation conditions influenced by altitude are encountered. The author describes qualitatively the temperature and precipitation including rainfall, snow, thickness of snow cover, icing, etc., in various planned courses of the highway. A map showing the various planned routes of the highway and graphs giving the beginning, end and duration of the snow cover in the Vienna woods as a function of elevation above sea level are presented. *Subject Headings:* **1. Highways 2. Altitude effects on precipitation 3. Snow cover 4. Vienna Woods.**—*I.L.D.*

8.10–65 551.585:634.9

*Thornthwaite, Charles W. (*Lab. of Climatology, Centerton, N. J.*) and Hare, F. Kenneth (*Dept. of Geog. McGill Univ. Montreal*), **Climatic classification in forestry.** *Unasylva*, Rome, 9(2):51–59, June **1955.** 2 figs., 5 tables, 19 refs., map (in color). **DLC**—The authors discuss the need for climatic classification, in spite of the difficulties involved in classifying anything which does not have discrete groups or areas with sharp boundaries. The requests from the Asia-Pacific Forestry Commission, FAO and the Humid Tropics program of UNESCO for climatic charts of the world are examples of the demand. A good historical review of classifications is presented, starting with A. Grisebach's (1866) world map of vegetation and considering Köppen's system as unsatisfactory for forestry uses and, finally, taking up the parameters of most importance (radiation, wind, turbulence, vapor lapse rate, soil and vegetation, the energy considerations of water deficiency, potential evapotranspiration and Thornthwaite's system and application to forestry. A beautiful color chart of Africa shows moisture regions. *Subject Headings:* **1. Climatic classifications 2. Evapotranspiration 3. Forest climatology charts.**—*M.R.*

INDUSTRIAL METEOROLOGY

See also: **Rainfall intensities for local drainage design** (U. S. W. B., U. S. Corps of Engrs.), 8.10–30.

8.10–66 551.508

Cook Research Laboratories. *American Meteorological Society, Bulletin*, 37(7):354–357, Sept. 1956. 4 photos. **DWB**—An illustrated article describing the organization and research activities (especially in meteorology) of the Cook Research Laboratories (of the Cook Electric Co.) formed in 1945 in Chicago. John C. Bellamy, Assoc. Dir., is responsible for much of the meteorology program, which comes under the Systems Development Section. It is concerned with developing instrumentation and processing systems for collection and analyzing meteorological data from aircraft reconnaissance flights with a minimum of loss of time in converting data from one form to another. The unitary digital decimal system, high speed analog computation, the bathymeter sonic anemometer-thermometer, ice free aircraft temperature probe, and a balloon-borne cloud level indicator are among the developments which have been promising. *Subject Headings:* **1. Meteorological instrument research 2. Communications development 3. Cook Research Laboratories.**—*M.R.*

8.10–67 621.397.9:551.509.2

Fidler, James C. (*Chief Met., Crosley Broad. Corp., Cin., Ohio*), **Dial WLW for weather.** *American Meteorological Society, Bulletin,* 38(2):59–61, Feb. **1957.** photo. **DWB, DLC**—Weather information and forecasts are presented to the public by radio or TV 18 times a day through facilities established in Cincinnati, in 1954 by the author. The TV presentations are seen 8 times a day over 3 stations in the Ohio Valley WLW-T-5 Cincinnati, WLW-D-2 Dayton and WLW-C-4 Columbus. The author's great experience in this field was called to set up and maintain an ideal TV meteorological station and service for the area. The station is financed by the Crosley Broadcasting Corp. The biggest job of the meteorologist-broadcaster is educating the public to understand the weather. *Subject Headings:* **1. Television weather broadcasts 2. Cincinnati, Ohio.**—*M.R.*

8.10–68 551.524.36:628.5

Gilkey, H. T.; Stoecker, W. F. and Konzo, S. (*all, Dept. of Engr., Illinois Univ.*), **Effects of weather conditions on cooling unit operation in a residence.** *American Society of Heating and Air-Conditioning Engineers, Transactions,* 61:255–276, pub. **1956.** 8 figs., 3 tables, 9 refs. **DWB**—Detailed weather data are used to estimate period of operation of air conditioning units, electricity and water consumption. Both continuous operation of the blower and having the blower cycled with the compressor were studied. The latter resulted in lower room humidities. Year round tests were made, showing that great variability occurs from season to season and is much greater for cooling than for heating. Weather indexes must be based on frequencies not on means so that predicted operating time will not be exceeded 3 years out of 4. Degree hours above 65°F gave good correlation with hours of compressor operation. Degree days are also good. *Subject Headings:* **1. Cooling degree days 2. Air conditioning weather data.**—*M.R.*

8.10–69 620.9:551.521.1

Heywood, Harold, **Solar energy: a challenge to the future.** *Nature,* London, 180(4577): 115–118, July 20, **1957. DWB**—Most early systems of utilizing solar heat used expensive mirror systems to generate steam. Scope has now changed from power development to collection of solar radiation as low grade heat. Principles of two sorts of solar radiation collectors—flat plate and paraboloid mirrors—are described. Flat-plate collectors are economical in the tropics. Mirror systems are used for cooking, larger ones for solar furnaces. *Subject Heading:* **1. Solar energy utilization.**—*C.E.P.B.*

8.10–70 551.311.18:627.8

Strauch, Karl Theodor (*Minden*), **Das Eisproblem bei Wasserkraftwerken.** [Icing problem in water power works.] *Die Wasserwirtschaft,* Stuttgart, 46(5):90–99, Feb. **1956.** 5 figs. (incl. photos), 14 refs. **DWB, DLC**—Various types of ice which form in the water power structures or machinery (surface, bottom and suspended ice), their effects on flow, the physical properties of freezing water, effect of an ice cover on temperature of water, effect of spring floods with a load of ice or an ice jam, methods of control of ice (ice-breakers, thermal methods, etc.) are treated. It is emphasized that protection is desirable but should not be overdone. *Subject Headings:* **1. Ice in hydraulic installations 2. Reservoir ice.**—*M.R.*

MARINE METEOROLOGY AND OCEANOGRAPHY

See also: **Climate of Arctic Ocean** (Herrmann), 8.10–6; **Water balance of Arctic Ocean** (Timofeev), 8.10–29; **Ice formation on German coasts of N. Sea and Baltic** (Goedecke), 8.10–108.

8.10–71 551.46:532.49

Darbyshire, J., **Attenuation of swell in the North Atlantic Ocean.** *Royal Meteorological Society, Quarterly Journal,* 83(357):351–359, July **1957.** 6 figs., table, 14 refs., 4 eqs. **DWB**—Waves recorded in the decay area by a ship-borne wave recorder on O.W.S. "Weather Explorer" are compared with estimates of waves in the generating area. By restricting attention to the wave energy contained within one-second wave period intervals, it is possible to eliminate

the effect of dispersion and to study the decrease in height due to loss of wave energy and the broadening of the wave front. While it is not possible to give an accurate assessment of the relative magnitude of these effects, the formula obtained in the case of calm conditions or following winds in the decay area is $H_T/H_{OT} = (300/R)^{\frac{1}{2}}$, where R is the distance of the recording point from the centre of the generating area. This formula does not depend on wave period and following wind speed, and suggests that the effect of broadening the wave front is the more important. It has been used successfully in predicting wave heights and periods at Casablanca. *Subject Headings:* **1. Ocean swell decay 2. North Atlantic.**—*Author's abstract.*

8.10–72 551.509.317

§Döös, Bo R. and Eaton, Max A. (*both, International Met. Inst., Stockholm*), **Upper-air analysis over ocean areas.** *Tellus*, Stockholm, 9(2):184–194, May **1957.** 11 figs., 4 tables, 3 refs., 22 eqs. **DLC**—From the results of a test of numerical analyses of 500 mb charts over an ocean area it is concluded that the number of ocean station vessels is a minimum and that supplementary upper air data is required to ensure continuously reliable upper air analyses. A method of determining the mean lapse rate by interpolation is presented by means of which heights of upper pressure surfaces can be extrapolated from observed values of surface pressure and temperature. An attempt is made to determine statistically the true mean error in the numerical analysis of upper-air charts. *Subject Headings:* **1. Upper air analysis over oceans 2. Weather ships.**—*Authors' abstract.*

8.10–73 551.515(261)

Rodewald, M., **Schwankungen der monatlichen Sturmhäufigkeit auf dem Nordatlantik.** [Variations of monthly storm frequency over the North Atlantic.] *Wetterlotse*, No. 122:197–200, Sept. **1957.** 2 tables. **DLC**—The mean monthly storm frequency gives only an incomplete picture of conditions in the N. Atlantic. The extremes and means of monthly storminess in percent of all winds are given for Weather Ship J, Nov. 1950–June 1957. Jan. for example ranged from 32.6 in 1957 to 1.2% in 1953, mean 14.2. *Subject Headings:* **1. Storm frequencies 2. Weather Ship J 3. North Atlantic.**—*C.E.P.B.*

8.10–74 551.556.81:551.46

Fomin, L. M., **O glubine proniknoveniia vetrovykh techenii v more.** [The depth penetration of wind currents into the sea.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 2:172–181, Feb. **1956.** 6 figs., 2 tables, 5 refs., 10 eqs. **DLC**—A method is developed for determining the lower limit of flow produced in the sea by wind. This limit is determined on the basis of the velocity of the surface flow, magnitude of the complete current, horizontal gradient of atmospheric pressure and the vertical structure of the density field of the sea water. It is assumed that the gradient constituent of velocity is geostrophic, that the coefficients of vertical exchange are not altered by the magnitude of movement in the vertical direction in the atmosphere and in the sea, and that the field of density of the sea water satisfies the model. The depths at which the velocity of flow constitutes a given part of the velocity of flow at the surface are evaluated. *Subject Headings:* **1. Wind driven currents 2. Current depth penetration 3. Current flow measurement 4. Current velocities.**—*Trans. of author's abstract.*

8.10–75 551.515:551.461.2

Harris, D. Lee (*Off. of Climatological Res., U. S. W. B., Wash., D. C.*), **Some problems involved in the study of storm surges.** *U. S. Weather Bureau. National Hurricane Research Project, Report*, No. 4, Dec. **1956.** 30 p. 23 figs., 27 refs. **DWB** (M15.2 U5845r). Also in: Tropical Cyclone Symposium, Brisbane, Dec. 1956, **Proceedings.** pub. Dec. **1956.** 8 figs., 27 refs., 7 eqs. **DWB**—The various forces which affect the height of the sea and the response of the sea to these forces are reviewed. An attempt to clarify the interactions among the astronomical, climatological, and meteorological forces involved, reveals that the response to any given force varies from one part of the sea to another, and that a complete separation of the effects produced by the various forces is impossible in the present state of knowledge. Some case studies of the "storm surge," the effect of a storm on sea level, are presented. A first approximation to the storm surge is obtained by subtracting from the observed sea level accurate predictions of the astronomical and climatological effects on sea level made by a

suitable tide machine. The resulting curves give clear indication of a reaction between the normal tides and the storm surge, but this method of treating the data gives a much clearer picture of the effects of the storm than can be obtained by studying only the observed sea level data. *Subject Headings:* **1. Storm surges 2. Storm surge calculation 3. Storm surge effects on sea level.**—*Author's abstract.*

8.10–76 532.593:551.465

Housley, John G. and Taylor, Donald C. (*both, Hydrodynamics Lab., M.I.T., Camb., Mass.*), **Application of the solitary wave theory to shoaling oscillatory waves.** *American Geophysical Union, Transactions,* 38(1):56–61, Feb. **1957.** 9 figs., 8 refs., 6 eqs. **DWB, DLC**—The celerities of shallow-water waves were studied in the laboratory as a function of wave height and wave length or period. The experimental celerities were compared to the theoretical values obtained from the oscillatory (Stokian) wave theory, the solitary wave theory, and the cnoidal wave theory. The last was found to be experimentally valid for the transition but is practically inapplicable for prediction. On the basis of this comparison, an effective wave length could be defined below which the Stokian theory applies, and above which the solitary wave theory gives better results. *Subject Headings:* **1. Solitary wave theory 2. Shallow water waves 3. Wave heights 4. Wave periods.**—*Authors' abstract.*

8.10–77 532.59:551.460.18

Rao, V. Narayana (*Naval Physical Lab., Cochin, India*), **An electronic sea-wave recorder.** *American Geophysical Union, Transactions,* 38(1):50-55, Feb. **1957.** 4 figs., 5 refs. **DWB, DLC**—This article describes a surface type of sea-wave recorder which is based on the principle of the variation in the capacitance between the sea water and an insulated wire placed vertically in it with changes in the level of the sea water. This change in capacitance is used to modulate the frequency of an oscillator. An electronic unit is used for recovering from the frequency modulated signal an electrical voltage which is in exact replica of the sea wave. This electronic unit is described in detail. The type of recording suitable for various applications and also the performance characteristics of this instrument are also discussed. *Subject Heading:* **1. Sea wave recorders.**—*Author's abstract.*

8.10–78 551.510.41:551.464:546.264

Revelle, Roger and Suess, Hans E. (*both, Scripps Inst. of Oceanog., Univ. Calif., La Jolla, Calif.*), **Carbon dioxide exchange between atmosphere and ocean and the question of an increase of atmospheric CO_2 during the past decades.** *Tellus,* Stockholm, 9(1):18–27, Feb. **1957.** 2 figs., 5 tables, 30 refs., 7 eqs. **DLC**—From a comparison of C^{14}/C^{12} and C^{13}/C^{12} ratios in wood and in marine material and from a slight decrease of the C^{14} concentration in terrestrial plants over the past 50 yrs it can be concluded that the average lifetime of a CO_2 molecule in the atmosphere before it is dissolved into the sea is of the order of 10 yrs. This means that most of the CO_2 released by artificial fuel combustion since the beginning of the industrial revolution must have been absorbed by the oceans. The increase of atmospheric CO_2 from this cause is at present small but may become significant during future decades if industrial fuel combustion continues to rise exponentially. Present data on the total amount of CO_2 in the atmosphere, on the rates and mechanisms of exchange, and on possible fluctuations in terrestrial and marine organic carbon are inadequate for accurate measurement of future changes in atmospheric CO_2. An opportunity exists during the International Geophysical Year to obtain much of the necessary information. *Subject Headings:* **1. Air-ocean carbon dioxide exchange 2. Carbon dioxide in oceans 3. Radiocarbon concentration.**—*Authors' abstract.*

8.10–79 551.55:551.501.42:577.475(26)

Seilkopf, Heinrich, **Bemerkungen über die Wirkung des "Plankton-Faktors" des Schäumens des Meerwassers auf die Bestimmung der Geschwindigkeits-Aquivalente der Windschätzungen auf See.** [Remarks on the effect of the "Plankton-factor" of the foaming of seawater in determining the equivalent velocities for Beaufort estimation of the wind force at sea.] *Annalen der Meteorologie,* 7(10/12):404–409, 1955/56. fig., 5 tables, 8 refs. German and English summaries p. 404. **DWB, DLC**—Seawater with a high plankton content has a

greater tendency to foaming than such with a low plankton content. As the estimation of the wind force at sea after the Beaufort-scale in the case of higher wind force (greater than 3 Bft) is dependent on the foaming of the sea surface-water (Petersen-scale) there also arises a relation between the plankton content of the seawater and the Beaufort-equivalents of the wind velocity. This relation is such that at a certain wind velocity the estimated Beaufort-scale-degree is lower when the plankton content is high (the seawater has a greater tendency to foaming), higher when the plankton content is low. *Subject Headings:* **1. Wind estimations 2. Plankton effects.**—*Author's abstract.*

8.10–80 551.556.8

Welander, Pierre (*Inst. of Theoretical Physics, Univ. of Stockholm*), **Wind action on a shallow sea: some generalizations of Ekman's theory.** *Tellus*, Stockholm, 9(1):45–52, Feb. **1957.** 5 figs., 6 refs., 35 eqs. **DLC** —In 1923 Ekman developed a theory for the sea-level changes produced in a deep sea by the action of a steady wind. In the present paper the theory has been extended to a shallow sea, for which the Ekman "depth of frictional influence" d is comparable to the actual depth h. It is pointed out that the wind-stress divergence may be of the same importance as the wind-stress curl in this case. The theory is furthermore extended to the transient case. It is demonstrated how the velocity profile and the flow can be expressed in terms of the local time-histories of the wind-stress and the surface slope, and a single integro-differential equation is derived for the sea-level elevation. This equation could possibly be used for prediction of meteorologic tides and storm surges. *Subject Headings:* **1. Wind effects on shallow water 2. Ekman's theory 3. Storm surge warnings.**—*Author's abstract.*

MEDICAL METEOROLOGY AND PUBLIC HEALTH

See also: **Aviation medicine,** 8.10–2; **Astronautical and spacemedical res.** (Ehricke), 8.10–51; **Health aspects of air pollution control** (Greenburg, Jacobs), 8.10–123; **Biomet. and man** (Berg), 8.10–274; **Body heat regulation** (Schreider), 8.10–275; **Thermal balance of human body** (U. S. Quartermaster Corps.), 8.10–276; **Hospital air conditioning** (Gaulin), 8.10–278; **Geiger counter measurement of radioactivity** (Steinhauser), 8.10–291

8.10–81 551.586

Kérdö, István, **A bioklimatologia alapfogalmai.** [Basic concepts of bioclimatology.] *Idöjárás*, Budapest, 60(4):227–235, July/Aug. **1956.** Russian and German summaries p. 227. **DLC**—Problems of the effect of various weather elements on living organisms and research objectives provided by such problems are reviewed. The field of bioclimatological research is outlined as follows: 1) Investigation of biological weather relations (keeping records of biological phenomena showing uneven distribution, and analysis of their correlations with single or combined weather factors, periodicities or climatic factors); 2) A detailed physical and chemical analysis of biologically pertinent atmospheric phenomena; 3) Analysis of the biological mechanism of weather effects (reactions of metabolism, circulatory processes, pathological processes, etc. to atmospheric phenomena); and 4) Practical applications (medical weather forecasting; development of drugs and other medication against harmful weather effects and bioclimatological evaluation of health resorts and workshops). The respective roles of meteorologists and biologists in attacking these problems are discussed. *Subject Heading:* **1. Bioclimatology.**—*G.T.*

8.10–82 551.521.63:616.5

Elschner, H., **Sonne und Hautschutz.** [Sun and skin protection.] *Umschau*, 57(14):417–418, 15 July **1957.** table, 5 refs. **DLC**—UV radiation is divided into: A, 315–400 mμ, B, 280–315 and C, <280. C is absorbed by oxygen and ozone and the remainder is scattered by small dust particles. Amount depends on height of sun, height above sea level, and reflection from snow or water. The first reaction is a reddening of the skin and a "zytotoxic" effect on histamines. Pigmentation of the skin soon follows. These effects are mostly due to B and C rays (<315 mμ); if these are cut off there is pigmentation without erythema. The usual

creams, oils, etc. are listed. *Subject Headings:* **1. Ultraviolet radiation effects 2. Erythema.** —*C.E.P.B.*

8.10–83 551.510.42:551.524.4(792)

Doyle, Henry N., **Polluted air: a growing community problem.** *U. S. Public Health Service, Public Health Reports*, 68(9):858–867, Sept. **1953.** 2 figs., 4 tables, 12 refs. Review by Z. Dukhanina in *Gigiena i Sanitaria*, Moscow, No. 3:60, March **1955. DLC**—This general survey of the problem of air pollution includes a brief discussion of the effect of meteorological factors. The relation of inversions to smog intensity is shown by a comparison of two situations in Salt Lake City (Feb. 8 and 15, 1951), one of which was characterized by a strong temperature inversion. Aerological diagrams, filter paper samples and views of the city are presented for both days. *Subject Headings:* **1. Atmospheric pollution 2. Inversion effects on atmospheric pollution 3. Salt Lake City, Utah.**—*G.T.*

ARTIFICIAL RADIOACTIVITY

See also: **Geiger counter detection of radioactivity** (Steinhauser), **8.10–291.**

8.10–84 551.510.42:551.594.14

Herbst, W. and Sommermeyer, K., **Über die γ-Spektren des radioaktiven Befalls aus der Atmosphäre.** [On the γ spectra of the radioactive fallout from the atmosphere.] *Naturwissenschaften*, 44(14):392, July 15, **1957.** fig. **DWB**—To determine how far the radioactivity of vegetation is absorbed from the soil or by fall from the air on the plant, γ spectra were compared of dust-collecting sheets exposed to the air for 8 days, and grass ash. They were similar. *Subject Heading:* **1. Radioactive fallout.**—*C.E.P.B.*

METEOROLOGICAL OBSERVATIONS AND INSTRUMENTS

METHODS OF OBSERVATION

See also: **Radar hurricane tracking** (Senn et al.), 8.10–21; **Antarctic res. stations** (Law, Burstall), 8.10–32; **Hist. of Kiev Met. Obs.** (Buchinskiĭ), 8.10–36; **High altitude res. station, White Mts.,** 8.10–37; **Mt. Washington Obs.** (Brooks), 8.10–44; **Double mass analysis of hydrologic effects** (Anderson), 8.10–63; **Wind estimation** (Seilkopf), 8.10–79; **Methods of exploring upper atmos.** (Engel), 8.10–128; **Upper air wind analysis** (Fea et al.), 8.10–195; **Statistical treatment of upper air wind data** (Henry), 8.10–196; **Ionos. wind measurement** (Rao, M. S.; Rao, B. R.), 8.10–198; **Radar echoes from clouds** (Changnon, Bigler), 8.10–228; **Radar structure of precip. streamer** (Altas), 8.10–242; **Radar rainfall measurement** (Harper), 8.10–244; **Hail frequency determination** (Thom), 8.10–247; **Precip. measurement** (Gt. Brit. Met. Off.), 8.10–249; **Climatological bench-mark network** (Swartz), 8.10–272.

8.10–85 551.501:551.510.534

Walton, G. F., **Ozone information from sky observations.** *Royal Meteorological Society, Quarterly Journal*, 83(357):366–368, July **1957.** 2 refs., 9 eqs. **DWB**—The information of the vertical distribution of atmospheric ozone obtainable from measurements of scattered sunlight received from various directions in the sky is considered. It is shown that observations in a particular direction in the sky could replace, but would not supplement the customary zenith sky observations, except in high latitudes at certain seasons of the year. Observations in various directions in the sky would be equivalent to zenith sky observations made throughout the day. *Subject Heading:* **1. Ozone measurement techniques.**—*Author's abstract.*

8.10–86 551.501.7:551.507.352:778.58

Schaefer, Vincent J. (*Munitalp Found. Inc.*) and Taylor, Wallace M. (*Air Wea. Service, U. S. A. F.*), **Weather reconnaissance by airborne time lapse camera.** *American Meteorological Society, Bulletin*, 38(4):206–209, April **1957.** 3 photos. **DWB.** Also issued in reprint as *Munitalp Foundation, Inc., Occasional Papers*, No. 0027, **1957.**—The operation, in a high

flying airplane, of a simple 16 mm time lapse motion picture camera produces an excellent record of the cloud systems and other visual atmospheric patterns existing over large areas of continent and ocean. Over the past several years such records were obtained from both jet and propeller driven planes at altitudes of 10,000 to 37,000 ft through the cooperation of the Boeing Airplane Company and the Air Weather Service, U. S. A. F. with the Munitalp Foundation. For the best results it was found that the camera should be mounted at right angles or at 45 degrees with respect to the flight path and with a downward tilt of from five to twenty degrees, depending on the cruising height of the plane. A two second interval was found to be suitable for good results with planes with an average speed in the range of 300–600 mph. Intervals of four to even ten seconds are permissible at these speeds for economy or convenience. When such a sequence is viewed as a movie, near clouds move by at a different rate from those in the middle or far distance thus giving an excellent illusion of three dimensions. Successive frames may be selected from a sequence and viewed in a stereoscope to get a three dimensional view of the area photographed. When projected at sound speed in a movie projector, a film made with a two second interval sequence presents the illusion that the viewer is travelling through the sky at a speed of nearly 29,000 mph. *Subject Headings:* **1. Aircraft weather reconnaissance 2. Airborne time lapse photography 3. Cloud photography.**—*Authors' abstract.*

8.10–87 551.501.8:551.577.2

*Huff, F. A.; Neill, J. C. and Spock, M., Jr., **Evaluation of a low powered 3-cm radar for quantitative rainfall measurements.** *Illinois. State Water Survey Div., Report of Investigation*, No. 29, **1956.** 35 p. 16 figs. (inc. photos), 16 tables, 8 refs., 27 eqs. **DLC.** Also issued as: Illinois. State Water Survey Div., Contract DA-36-039 SC-64723, Project 3-99-07-022, Project SC 172 B, Research Report, No. 4, **1956.**—A comparison of empirically computed rainfall amounts for 28 storm periods over a 100 sq mi area in Goose Creek network near Champaign, Ill. with actual rain gage observations, shows that the former are too low, even even when use is made of an improved empirical formula: $\log \frac{P_r R^2}{P_t} = 2.00 \log I - 11.641$ (where P_r is power received in watts, P_t power transmitted, R range in nautical miles and I rainfall intensity in inches/hr) if a dense network of rain gages is used. If one gage is used per 100 sq mi, results of the 3-cm radar observations are better in 54% of the cases and worse in 46% of cases. Failure of radar is due to attenuation in showering rain. Empirical equations must be based on relations involving too much scatter. Data are presented *in extenso. Subject Headings:* **1. Radar rainfall measurements 2. Rain gage networks 3. Goose Creek, Ill.**—*M.R.*

8.10–88 551.501.81:551.577:551.58

§Blackmer, Roy H., Jr. and Morgenstern, Paul, **Studies in radar climatology.** Massachusetts Institute of Technology. Dept. of Meteorology, Contract DA-36-039-SC-71136, Research Report, No. 25, June **1956.** 52 p. **DWB.** Contents: Morgenstern, Paul: **The synoptic climatology of weather radar pictures,** p. 1–35. 9 figs., 20 tables, 6 refs., eqs. Blackmer, Roy H., Jr.: **Lifetime of the small precipitation echoes observed on the PPI scope of the SCR-615-B radar,** p. 37–52. 11 figs., 9 refs. Paper by Blackmer also issued as *Weather Radar Conference*, 1955, *Proceedings*, pub. **1956.** p. 103–108. Paper by Morgenstern, *Ibid.*, p. 109–112. **DWB**—After a definition of the scope of radar climatology (by PAULINE AUSTIN), these papers discuss: (1) the synoptic climatology of radar weather photographs (i.e. the statistical relations between the pictures and the main circulation parameters) and (2) the range of variation (15 min to 200 min) of the lifetime of small precipitation echoes for warm front situations. The shortest lived echoes are the most frequent. Many data are presented in analytical form. *Subject Headings:* **1. Radar climatology 2. Radar precipitation echo duration frequencies 3. Synoptic climatology. I. Austin, Pauline M.**—*M.R.*

8.10–89 551.501.81:523.3

Blevis, B. C., **Ionospheric studies by the lunar radar technique.** *Nature*, London, 180(4577):138–139, July 20, **1957.** 2 figs., 5 refs. **DWB**—Describes apparatus and results of lunar echoes. *Subject Heading:* **1. Radar reflection from moon.**—*C.E.P.B.*

8.10–90 551.501.81:551.577

Illinois. State Water Survey. Meteorologic Lab. at Illinois Univ., **Study on intensity of surface precipitation using radar instrumentation.** Contract DA-36-039 SC-64723, Project DA 3-99-07-022 Seventh Quarterly Technical Report, Jan. 1–March 31, **1957.** 8 p. 5 figs., 2 tables. **DWB**—Routine operation of the CPS-9 and TPS-10 was accomplished during the period. Breadboard testing and some circuit modifications were accomplished on the attenuation correction circuits. Mirrors, 70-mm camera, and parts for flash equipment were ordered and negotiations were carried on to establish rain drop cameras in Florida and Oregon. An analysis which corrects for attenuation was completed and the results are encouraging. A second method of analysis on the correlation of surface rainfall with PPI echoes was completed and the results confirm those reported previously. An analysis was begun on the spatial distribution of drops to facilitate future automatic analysis of data and to determine the relation between a cubic meter sample and a portion of the radar volume. *Subject Headings:* **1. Radar precipitation echoes 2. Rainfall intensities. I. Mueller, E. A.**—*Author's abstract.*

8.10–91 551.501.81:551.577.11

Lhermitte, R., **Structure verticale des échos de pluie.** [Vertical structure of rain echoes.] *I.U.G.G. Association of Meteorology, Rome, Sept. 1954, Scientific Proceedings.* London, Butterworth, **1956.** p. 53–57. 4 figs., eq. **DWB**—On a radar apparatus for studying radar echoes the transmitter explores the entire vertical field by complete rotation about a horizontal axis. Even echoes at feeble distances are reproduced upon screens in their true aspect with fine details of their structures. The most simple case studied is that of a point source moving in equilibrium with the wind V_0 in altitude and in which the droplets that form continually attain rapidly a constant velocity. In this theoretical study the author examines the effect of the rate of fall and the case when the droplets form not only at a given level but in an atmospheric layer. It was found that on the average the vertical structure of the wind exerts a very distinct influence, much greater in the region above the 0° isotherm. This indicates that in this region the rate of fall of particles is very small and that frozen particles (Bergeron mechanism) are present. *Subject Headings:* **1. Radar precipitation echoes 2. Rain structure.** —*I.L.D.*

8.10–92 551.501.83

Hepburn, F., **Atmospheric waveforms with very low-frequency components below 1 kc/s known as slow tails.** *Journal of Atmospheric and Terrestrial Physics,* 10(5/6):266–287, **1957.** 10 figs., 3 tables, 21 refs. **DWB**—Origin of "slow tails" is discussed. Recent observations of form, magnitude, quasi-period and delay of slow tails are described and their theoretical explanation in terms of source and propagation set out. Examples of slow tails are illustrated and diurnal variation with respect to sunset at source plotted. Amplitude increases from day to night, quarter period by day and with storm distance. Delay increases more rapidly by day than night and more rapidly than quarter periods. Theory of origin is discussed; day and night ionosphere parameters are evaluated for heights of 50–90 km. *Subject Headings:* **1. Sferics wave forms 2. Slow tails.**—*C.E.P.B.*

OBSERVATIONAL DATA

See also: **Wind field analysis** (Saltzman, Peixoto), 8.10–199; **Climatic data, N. Mex.** (N. Mex. State Engr. Off.), 8.10–260; **Precip. data for N. Mex.** (N. Mex. State Engr. Off.), 8.10–261.

8.10–93 551.506:551.524.37(548)

*Balasubramanian, C. and Bakthavathsalu, C. M. (*both, Agricultural Res. Inst., Coimbatore*), **A preliminary study on frost formation at Nanjanad: Nilgiris District.** *Indian Journal of Meteorology and Geophysics,* Delhi, 7(4):404–405, Oct. **1956.** 4 tables. **DWB, DLC**—The authors determine mean monthly number of frost days at Nanjanad for the period 1930–1954; range of difference between previous afternoon maximum and morning minimum temperature on frost days, diurnal range of temperature on nonfrost days and range of drop in the minimum

temperature. No appreciable drop in minimum temperature on the day of occurrence of frost from that of previous day was noted in Nanjanad. *Subject Headings:* **1. Frost data 2. Long period records 3. Minimum temperatures 4. Nanjanad, India.**—*I.L.D.*

8.10–94 551.506:551.521:523.78

Schüepp, W. (*Bureau de Rayonnement de Service Météorologique du Congo Belge*), **La mesure de l'assombrissement du soleil pendant une éclipse.** [Measurement of solar radiation during an eclipse.] *Tellus*, Stockholm, 9(2):238–249, May **1957.** 10 figs. (incl. photos), 4 tables, 14 refs., eqs. **DLC**—Measurement of solar radiation in 7 monochromatic regions, and measurements of total, diffuse and direct radiation, during the partial eclipse of Feb. 25th 1952 at N'dele (8°24′25″N., 20°40′0″E.) lead to a determination of solar limb darkening, even for the region between 99 and 100% of the sun's radius. The values of MINNAERT (1953) and PEYTURAUX (1952, 1955) are confirmed, the formula of HOUTGAST (1952) is shown to be incorrect. This confirms the idea of PLASKETT (1936) that there must be a very strong temperature gradient near the surface of the photosphere. Using the new formula from WARZÉE (1955) the constants for total radiation are computed and compared with the radiative equilibrium and with the case of a mean wavelength of 548.5 mμ. The difference with respect to the case of 548.5 mμ is due to the fact that the center of sun disc is bluer and the border is redder than this wavelength. *Subject Headings:* **1. Radiation measurement during eclipse 2. Solar eclipse, Feb. 1952.**—*Author's abstract.*

8.10–95 551.506.1(471.1)

*Finland. **Ilmatieteellinen Keskuslaitos, Ilmatieteelliset Havainnot Suomessa.** [Meteorological observations in Finland], 1940, 1941, 1942 and 1943. issued **1955, 1955, 1956** and **1956.** 4 pieces. about 70 p. each. Almost entirely tables. Its *Suomen Meteorologinen Vuosikirja*, 40(1), **1940**; 41(1), **1941**; 42(1), **1942** and 43(1), **1943. DLC, DWB**—In the four yearbooks for 1940, 1941, 1942 and 1943 the same general plan is followed as for years 1939 and earlier years (*see* 6.9–89, Sept. 1955, *MAB*). Data from recording instruments at Ilmala Observatory (hourly values of pressure, temperature, relative humidity, wind velocity, cloud type and height, precipitation, sunshine, cloud cover, vapor pressure, visibility, hydrometeors, vector winds, etc.) and full daily summaries of usual elements observed at 6 other stations. Annual and monthly summaries at 100 second and 3rd order stations. *Subject Headings:* **1. Annual meteorological reports 2. Finland. I. Rossi, V.** (*ed.*) **II. Kolkki, O.** (*ed.*).—*M.R.*

8.10–96 551.506.7(436)

*Austria. Zentralanstalt für Meteorologie und Geodynamik, **Aerologische Berichte: Radiosondenaufstiege und Höhenwindmessungen.** [Aerological report: radiosonde ascents and upper wind measurements], Jan.–June and July–Dec. **1956.** 2 pieces. about 50 p. each. Almost entirely tables. "Begins publication with Jan.–June 1956 issue." **DWB**—A new series of upper air sounding (radiosonde and pilot balloon) data compilations for Hohe Warte, Vienna. The data for 1000, 850, 700, 500, 400, 300, 250, 200, 150, 100 and 50 mb and significant points; the main and secondary tropopauses and wind maximum are given for each observation (02 and 14 h) plus the rawin data and the wind direction and speed for standard levels (for 09 h and 21 h) from pibals. Data include temp., height, humidity, dew point, wind direction and speed, and the pressure of each significant level. At the end of the year a summary of data on height, temp. and relative humidity for the surface, 1000, 950, 900, 850, 800, 750, 700, 650, 600, 550, 500, 450, 400, 350, 300, 250, 200, 175, 150, 125, 100, 80, 60, 50, 40, 30, 20, 15 and 10 mb for each month and for the year is given for 0200 and 1400 Z. *Subject Headings:* **1. Aerological data yearbooks 2. Upper air soundings 3. Austria.**—*M.R.*

INSTRUMENT CARRIERS

See: **Satellite orbits,** 8.10–52; **Satellite observatories** (Thiruvenkatachar), 8.10–53; **Satellite temp. calculations** (Goldman, Singer), 8.10–54; **Airborne time lapse camera** (Schaefer, Taylor), 8.10–86; **Balloon soundings** (Gates), 8.10–99.

INSTRUMENTS

See also: **Improvement in met. equipment**, 8.10–40; **Development of met. instruments by Cook Res. Labs.**, 8.10–66; **Upper atmos. instruments** (Engel), 8.10–128; **Ozone absorption** (Walshaw), 8.10–131; **Geiger counter measurement of radioactivity** (Steinhauser), 8.10–291.

8.10–97 551.508

Bindon, H. H. (*Asst. Controller-Instr. Serv., Canada*), **Meteorological instruments.** *Weatherwise*, Boston, 9(2):68-69, April **1956. DWB**—Instruments brought to Canada from England in the early days did not have sufficient range or ruggedness for the rigors of Canadian climate. In 1928 an Instrument Section was formed and a shop built at the Head Office in Toronto. J. PATTERSON, controller at the time, developed a fixed cistern barometer which was portable and rugged. The Canadian radiosonde, barograph, 3-cup anemometer and indicator, etc., produced in quantity, are described briefly. A novel dew and frost-point recorder is being tested for use at Arctic stations. *Subject Headings:* **1. Canadian meteorological instruments 2. Instrument design 3. Patterson barometer 4. Canadian radiosondes 5. Canada.**—*M.R.*

8.10–98 551.508

Puckle, G. M., **A lamp protector for a tilting-siphon recorder and a grass-minimum thermometer support.** *Meteorological Magazine*, London, 86(1021):218–219, July **1957.** 2 figs. **DWB**—To prevent water condensing on the cold collector from dripping on to a warming lamp in frosty weather, a round tin lid beaten into a dome is effective. A removable grass minimum support of 3-ply is also described. *Subject Headings:* **1. Rain gage lamp protector 2. Grass minimum thermometer.**—*C.E.P.B.*

8.10–99 551.508.25:551.521.61:551.507.321.2

Gates, David M., **Ultrarot-Spektroskopie von Sonne und Atmosphäre.** [Infrared spectroscopy of sun and atmosphere.] *Umschau*, 57(14):419–420, July 15, **1957.** 5 figs. **DLC**—The absorption and emission of infrared radiation is shown for a number of polyatomic gases. Height distribution is being found with stabilized (sun-seeking) spectrographs fitted to balloons. The first flight was on 22.6.1955 in New Mexico, and remained 15 min at 31.4 km. Examples of absorption spectra are shown. Amount of water vapor decreased from 1.43 mm above 3.35 km to 0.05 mm above 12.2 km. *Subject Headings:* **1. Infrared spectroscopy 2. Balloon soundings.**—*C.E.P.B.*

8.10–100 551.508.7:551.573

King, K. M.; Tanner, C. B. and Suomi, V. E., **A floating lysimeter and its evaporation recorder.** *American Geophysical Union, Transactions*, 37(6):738–742, Dec. **1956.** 5 figs., 12 refs., eqs. **Discussion** by L. L. Harrold et al., in *Ibid.*, 38(5):765–768, Oct. **1957. DWB, DLC**—A weighing lysimeter is described which operates on Archimedes' principle and which has been used to obtain continuous values of evapotranspiration from an irrigated pasture. Some errors in evaluation of evapotranspiration by means of a lysimeter are discussed. *Subject Headings:* **1. Lysimeters 2. Evapotranspiration measurement.**—*Authors' abstract.*

8.10–101 551.508.765

Sivadjian, Joseph, **The sampling of rain and cloud drops using hygrophotographic plates covered with various kinds of oil.** *Royal Meteorological Society, Quarterly Journal*, 83(357): 372–374, July **1957.** 3 figs., 6 refs. **DWB**—A hygrophotographic plate is prepared by impregnating an ordinary photographic plate with a double salt of mercury and silver iodide. Exposed to light it turns blackish-violet, but returns to yellow under the action of water. It can be used to obtain life-size images of water droplets of 20–30μ diameter on spider webs or in natural clouds. Drops of 100–200μ can be collected by smearing the plate with castor oil. *Subject Headings:* **1. Raindrop size distribution measurement 2. Hygrophotographic plates.**—*C.E.P.B.*

8.10–102 551.508.77:551.578.4

Thams, J. Chr., **Eine Sonde zur Messung der Temperatur in der Schneedecke.** [A sonde to measure temperature in a snow cover.] *Naturforschende Gesellschaft Graubundens,*

Jahresbericht, 79:1–12, **1948.** 4 figs., 4 refs. **DWB**—A copper-constantan thermocouple is placed in a cone similar to the rawinsonde for better penetration into the snow cover. The measuring cone (16 cm²) is insulated by hard rubber against the carrying rod. Series of measurements on slopes show microclimatic peculiarities. *Subject Headings:* **1. Snow thermometers 2. Snow microclimatology.**—*A.A.*

8.10–103 551.508.79:551.578.4:551.594.14

Higashi, Akira and Itagaki, Kazuhiko, **A radioactive snow gauge for practical use, Pt. 1.** *Journal of Applied Physics*, Tokyo (?), Japan, 25(3):93-98, 1956. 11 figs. (incl. photos), 2 refs. **DWB**—A new type of radioactive snow gage has been designed for use in estimating available water supply in the Lake Shikaribetsu basin. The principle is similar to that used by GERDEL (1950), and is based on the mass absorption of gamma rays emitted from radioactive cobalt (Co^{60}) suspended above the snow cover. The ethyl formate quenched beta and gamma counter is buried just beneath the earth's surface. The details of the counter and telemetering system are shown in illustrations. Transmission is by Morse Code. Calibration curves for the counter and output meter are presented. Equipment was successfully tested at Sapporo. *Subject Headings:* **1. Radioactive snow gages 2. Lake Shikaribetsu, Japan.**—*M.R.*

SYNOPTIC ANALYSIS AND FORECASTING

See also: **Atmos. pollution control** (Rose, Wood), 8.10–3; **Hist. of forecasting** (Wehner, Ziemann), 8.10–13; **Extended forecasts of pressure height, N. America** (White), 8.10–25; **Synoptic-aerological res.** (Zubian), 8.10–26; **Airport landing forecasts** (Proctor), 8.10–59; **Frost protection** (Gol'tsberg), 8.10–60; **Frost protection** (Krasikov, Smirnov), 8.10–61; **Television weather broadcasts** (Fidler), 8.10–67; **Upper air analysis over oceans** (Döös, Eaton), 8.10–72; **"Western disturbances" and Indian weather** (Pisharoty, Desai), 8.10–147; **Weather and winds, Singapore** (Sharp, Scott), 8.10–201; **Synoptic studies** (Caton), 8.10–232; **European weather types** (U. S. A. W. S.), 8.10–280.

8.10–104 551.509.3(267)

Viaut, André, **Quelques considérations sur le champ de pression et les perturbations du front polaire austral dans le sud sud-ouest de l'Océan Indien.** [Some considerations on the field of pressure and the perturbations of the southern polar front in the south-south-west Indian Ocean.] *I.U.G.G. Association of Meteorology, Rome, Sept. 1954, Scientific Proceedings.* London, Butterworth, **1956.** p. 290–301. 4 figs., 8 refs. **DWB**—On the basis of observations made during the period 1950–1953 in the Kerguelen Archipelago, Amsterdam Island and Adélie Land, the author discusses with the aid of graphs and synoptic charts the characteristics of the pressure field, the origin of the perturbations of the "polar front," their progression, the characteristics of the air masses, and the properties of the winds. *Subject Headings:* **1. Synoptic studies 2. Indian Ocean.**—*I.L.D.*

8.10–105 551.509.317:551.511.6:551.551.5

Keitz, Edwin L., **Differential advection as a factor in clear air turbulence.** N. Y. Univ. College of Engineering. Research Div. Dept. of Meteorology and Oceanography, Contract AF 19(604)-1387, Scientific Report, No. 2, March **1957.** 35 p. 18 figs., 6 tables, 23 refs., 21 eqs.—Clear air turbulence observations made by accelerometer measurements have been correlated with six hour forecasts of the change in stability throughout the layer in which the observations were made. The change in stability has been forecast by computing the six hour horizontal temperature advection using the actual wind field. By means of the KOLMOGOROV-SMIRNOV nonparametric test for cumulative distributions, a significant correlation at the 95% level has been shown to exist between the observations of turbulence and the forecast change in stability. The observations made at 30,000 ft have been shown to be more significant than those made at 35,000 ft. However, no significance has been established regarding the magnitude of the turbulence. Frequency diagrams for the occurrence and non-occurrence of turbulence at 30,000 ft and 35,000 ft have been presented. *Subject Headings:* **1. Clear air turbulence 2. Differential advection 3. Stability forecasting.**—*Author's abstract.*

8.10–106 551.509.317:551.547:551.511

§Nania, Abele, **Sulla distribuzione dell'energia sulle carte a pressione costante.** [Distribution of energy on constant pressure charts.] *Rivista de Meteorologia Aeronautica*, Rome,

17(2):40–44, April/June **1957.** 6 figs. Italian, French, English and German summaries p. 40. **DLC**—An application of the BERNOULLI-BJERKNES equation to 500 mb maps is made, and a connection with the ROSSBY theory of constant vorticity trajectories is attempted. *Subject Headings:* **1. Constant pressure charts 2. Bernoulli-Bjerknes equation 3. Constant vorticity trajectories.**—*Author's abstract.*

8.10–107 551.509.318

Girs, A. A., **Preobrazovanie form atmosfernoĭ tsirkuliatsii i ikh analiz.** [Transformation of types of atmospheric circulation and their analysis.] *Meteorologiia i Gidrologiia*, Leningrad, No. 3:12–20, March **1956.** 5 figs., 9 refs. **DWB, DLC**—The atmospheric circulation types of G. IA. VANGENGEIM and their use in studying large scale weather processes are described briefly and it is pointed out that for short range forecasting these circulation types must be broken down into elementary synoptic processes. The analysis of the large and small weather type transformation is by the method of integral curves. The quantitative characteristics of the transformations of the W, C, and E types and of the natural synoptic periods are determined by understanding charts of pressure and temperature field differences. In order to exclude the effects of the annual variations of temperature and pressure, integral curves are constructed. This involved the comparison of daily pressure for a station with the normal for the given station and the algebraic additions of the deviations. The algebraic sums constitute the ordinate and the time in days constitutes the abscissa. The manner of analysis is illustrated by specific examples. *Subject Headings:* **1. Weather types 2. Synoptic analysis.** —*I.L.D.*

8.10–108 551.509.318:551.311.181:551.46

Goedecke, Erich, **Über die Bedeutung der Ost-Wetterlagen Mitteleuropas für die Vereisung der Deutschen Nord- und Ostseeküsten.** [On the importance of easterly weather conditions over Central Europe to the formation of ice on the German coasts of the North Sea and the Baltic.] *Annalen der Meteorologie*, 7(10/12):386–403, **1955/56.** 11 figs., 4 tables, 23 refs. German and English summaries p. 386. **DWB, DLC**—Large scale easterly weather situations showing highs over Fennoscandia and/or North Sea, or to N.E. or S.E., for 10-day periods 1881–1956 are related to the occurrence of ice conditions of different severity between rivers Ems and Trave. For winters 1896/7–1955/6, the ice conditions are given by 10-day periods Nov.–March. This is followed by a detailed account of winter weather of 1939/40, 1941/2 and 1946/7, representing different types of ice winter. A summary of ice periods of German coasts is given and finally the effects of a secular change in the number of days with easterly weather is briefly discussed. *Subject Headings:* **1. Sea ice 2. German coast.**— *C.E.P.B.*

8.10–109 551.509.318(4)

Urbani, Marcello, **Su una classificazione di tipi di tempo in Europa.** [A classification of weather types in Europe.] *Rivista di Meteorologia Aeronautica*, Rome, 15(3/4):30–37, July/ Dec. **1955.** 2 figs. French, English and German summaries p. 30. **DWB, DLC**—An analysis of 247 synoptic situations of the period 1945–1955 resulted in the establishment of 24 types of general circulation which were arranged into seven basic groups. A typical synoptic chart is presented for each of the seven groups, their main features are described and frequencies of their occurrence tabulated and offered as a basis for statistical weather forecasting. *Subject Headings:* **1. Synoptic types 2. Europe.**—*G.T.*

8.10–110 551.509.318:551.515.3

Whiting, R. M. (*Eastern Airlines, Atlanta, Ga.*), **The surface chart as a synoptic aid to tornado forecasting.** *American Meteorological Society, Bulletin*, 38(6):353–356, June **1957.** 4 figs., 4 refs. **DWB, DLC**—An attempt is made to relate the occurrence and the location of tornado activity to areas of intense surface warm advection as indicated by the isobars and isotherms on the sea level chart. The degree of cross-isotherm flow is classified by the packing of the thermal field and the temperatures in it along with the strength and direction of flow as indicated by the isobars to determine short range forecasting patterns. The method presented is limited in that it is not applicable to all tornado situations and is offered as a

supplementary technique which could serve to raise the confidence level of short range tornado forecasts based on upper air parameters. *Subject Headings:* **1. Synoptic conditions for tornadoes 2. Tornado forecasting 3. Surface charts.**—*Author's abstract.*

8.10–111 551.509.33

Kopcewicz, Teodor, **O metodzie pieciodniowej prognozy meteorologicznej dla Polski.** [A method of 5-day weather forecasting for Poland.] *Przeglad Meteorologiczny i Hydrologiczny*, Warsaw, 6(3/4):74–75, **1953.** 5 refs. **DWB**—The kinematic method developed differently in various countries seems to be the best method for 5–7 day forecasting. The method and the possibility of its use in Poland are discussed. A general classification of the weather in Poland by different values of the zonal index, corroborated by analyses of 5 synoptic maps stressing the conditions for occurrence of precipitation, is introduced. Finally, the author considers the possibility of applying the method in the summer season—which has not been done in view of the small value of the zonal index at that time. *Subject Headings:* **1. Long range forecasting 2. Kinematic analysis 3. Poland.**—*A.M.P.*

8.10–112 551.509.33:519.2

Wahl, Eberhard W., **Bemerkungen zur Auseinandersetzung v.d. Bijl/Müller-Annen.** (Ann. Met., 7(7/9), 1955–56, p. 289–309.) [Remarks on the discussion between v.d. Bijl/Müller-Annen.] *Annalen der Meteorologie*, 7(10/12):410–411, **1955/56.** 4 refs. **DWB, DLC.**—Further remarks on VAN DER BIJL's discussion (*see* 8.5–166, May 1957, *MAB*) of MÜLLER-ANNEN's contingency method of long range forecasting. *Subject Headings:* **1. Long range forecasting 2. Statistical forecasting.**—*C.E.P.B.*

8.10–113 551.509.5:551.579

Beaumont, Robert T. (*U. S. Soil Conservation Service, Portland, Oreg.*), **A criterion for selection of length of record for a moving arithmetic mean for hydrologic data.** *American Geophysical Union, Transactions*, 38(2):198–200, April **1957.** 4 figs., ref., eqs. **DWB, DLC**—In forecasting runoff a reliable base period is usually needed for reference. A procedure has been derived by which an objective selection as to the best length of record can be made for computation of a moving arithmetic mean. Results are given for several records of precipitation and runoff at stations in the western United States. *Subject Headings:* **1. Runoff forecasting 2. Western United States.**—*Author's abstract.*

8.10–114 551.509.5:551.515.4

Elser, Harry L. (*W. B. Airport Station, El Paso, Tex.*), **Thunderstorm study for El Paso, Texas.** U. S. Weather Bureau, April 27, **1956.** 6 p. 2 figs., 5 tables. **DWB**—Monthly frequency distribution of thunderstorm days for El Paso for period 1879–1953 differs very little from that for period 1939–53 used in this analysis, although the average number per year is much greater in the shorter period (possibly due to having 24-hr observing service). The frequency distribution of all days (July for 15 yrs) as a function of dew point temperature at 0530 and 1130 local time; and of thunderstorm days with respect to all days vs. dew point at 1130 local time, and of thunderstorm and distant lightning days vs. dew point at 1130, is shown in tables and (for 0530 and 1130) on a graph, indicating that the probability of a thunderstorm increases markedly for dew points from 47° to 65°, and exceed the climatological average of 37% for dewpoints above 51°F (0530 MST), and is unlikely for dew points <50°F. The higher the dew point, the earlier the time of beginning of thunderstorm is likely. *Subject Headings:* **1. Thunderstorm forecasting 2. Thunderstorm frequencies 3. Objective thunderstorm forecasting 4. El Paso, Texas.**—*M.R.*

8.10–115 551.509.53

Artamonov, A. A., **Sposob predvychisleniia temperatury vozdukha.** [A method of predicting air temperature.] *Meteorologiia i Gidrologiia*, No. 12:36–39, Dec. **1956.** 2 figs., 3 tables, 6 eqs. **DWB, DLC**—On the assumption that the annual variation of air temperature from month to month can be approximated by a periodic function with specific characteristics increasing in magnitude during the first half of the year, decreasing during the second half, and passing through zero in the middle of the year, the author develops a formula for pre-

calculating air temperatures. This formula is

$$T_n = T_{n-1}(D^T{}_{n-1} + D^{T'}(N)'_{n-1})/2$$

The cartographic expression of expected variation of temperature from the normal for the period in the formula

$$D^T{}_{n-12} = T_{n-12} - T'(V)_{n-12}$$

is used. The use of these formulas and their validity is illustrated with the aid of temperature data for Moscow. *Subject Headings:* **1. Temperature forecasting 2. Temperature calculations 3. Moscow, U.S.S.R.**—*I.L.D.*

ARTIFICIAL PRECIPITATION

See also: **Icing nucleibility** (Sänger), 8.10–214.

8.10–116 551.509.67

Baum, Werner A.; Asplund, Stanley E.; Henry, Robert M.; Long, William H. and Rosenthal, Stanley L. (*all, Florida St. Univ.*), **Assessment of the effect of commercial cloud seeding in North Florida and South Georgia, 1955–1956.** *Florida Academy of Sciences, Gainesville, Quarterly Journal,* 19(2/3):104–120, June/Sept. 1956. 5 figs., 3 tables, 8 refs. **DLC**—Carefully devised tests of cloud seeding (by means of Ag I from ground generators) effectiveness during the large-scale seeding operations in North Florida from July 1, 1955–Jan. 1956, indicate that a high probability exists that a decrease in rainfall occurred in July–Aug. 1955 and an increase in Jan.–Feb. However, such summer decreases may be expected one year in ten and winter increases 4 years in ten, as a result of random variations. Regression curves on scatter diagrams show relation of target to control area precipitation figured according to 2 methods. Chances of specified increases or decreases, based on raw data, are given in tables. *Subject Headings:* **1. Cloud seeding with silver iodide 2. Cloud seeding effectiveness 3. North Florida.**—*M.R.*

8.10–117 551.509.67

§*Mount Washington Observatory, Gorham, New Hampshire, **Operation Overseed: Final report to the Advisory Committee on Weather Control, Dec. 1955–June 1956.** Issued, Milton, Mass., Nov. 14, 1956. 116 p. figs., tables, refs. **DWB**—An analysis of 61 attempts at seeding clouds in the Mt. Washington area to show the efficacy of Ag I in producing ice nuclei downwind. From 3 to 28 ground generators were used during 3,000 hrs from Dec. 1, 1955 to June 15, 1956. The maximum concentration at 12 mi distance was 10^4 to 10^5 nuclei/m^3 at -20°C. Each attempt is analyzed synoptically (surface and 850 mb synoptic charts) and aerologically (Portland, Me. sounding), and from the point of view of meteorological and cloud physics parameters. Decay occurred at the rate of 2 orders of magnitude in 30 min exposure at -15°C when the Ag I in acetone and propane method was used. A definite increase in nuclei was noted in half of the cases. Photos, tables and graphs are included along with the discussion and synoptic analysis. It was concluded that "overseeding" of supercooled clouds with large numbers of Ag I particles was not possible even with 28 generators operating simultaneously. Proper targetting was most important factor and best results occurred with unstable lapse rates. The 61 attempts were made under carefully chosen conditions with respect to air flow between generators and Mt. Washington Observatory where the nuclei counts were made. *Subject Headings:* **1. Cloud seeding effectiveness 2. Ag I effectiveness 3. Operation "Overseed" 4. AgI decay rate 5. Mt. Washington, N. H. I. Boucher, Roland J. II. U. S. Advisory Committee on Weather Control.**—*M.R.*

8.10–118 551.509.6

Statement on weather modification. *American Meteorological Society, Bulletin,* 38(6):36(June 1957. **DWB, DLC.** Also: **Statement on weather modification** (by the Council. Fc release May 10, 1957. 2 p.).—The Council of the A.M.S. issued a statement on weathe modification in 1951 and 1953. A revised statement approved in April 1957 is presente The 9 points covered include: 1) effectiveness of dry ice seeding of supercooled clouds; 2) water seeding; 3) fog dissipation; 4) Ag I seeding; 5) need for active source of moisture clouds; 6) ground based Ag I successes; 7) randomized experiments essential for evaluatior

8) no evidence of large scale modification possibilities; 9) all attempts must be considered experimental and conducted as scientific experiments. As usual, a note of cautious optimism is expressed throughout the statement. *Subject Headings:* **1. Weather modification 2. Cloud seeding.**—*M.R.*

STRUCTURE AND PHYSICS OF THE ATMOSPHERE

COMPOSITION OF THE ATMOSPHERE

See also: **Weather events as physical processes** (Philipps), 8.10–12; **Air-ocean carbon dioxide exchange** (Revelle, Suess), 8.10–78; **Ozone measurement techniques** (Walton), 8.10–85.

8.10–119 551.510:523.43

Dollfus, A. (*Meudon Obs.*), **Les conditions météorologiques sur la planète Mars.** [Meteorological conditions on the planet Mars.] *La Météorologie*, Paris, No. 42:81–91, April/June **1956.** 8 figs., table, eqs. English and Spanish summaries p. 81. **DWB**—From photometric, spectral, energetic and polarimetric analyses of the light received from Mars or portions of it (Pic du Midi, since 1941) the author derives properties of the planet's atmosphere. Surface pressure is estimated to be 90 mb; reduced thickness of water content would be of the order of 0.1 mm, assuming 25% of saturation and a surface temperature between −30 and −40°C. The various types of clouds observed are described in particular detail (some shown in photographs). Seasonal phenomena and the hydrologic cycle are discussed. *Subject Headings:* **1. Martian atmosphere 2. Mars.**—*G.T.*

8.10–120 551.510:523.43

†McLaughlin, Dean B. (*Univ. Mich.*), **New interpretation of the surface of Mars.** *Scientific Monthly*, Wash., D. C., 83(4):176–188, Oct. **1956.** 9 figs., table, 40 refs. **DLC**—The author believes that wind action plays an exceedingly important role in the geomorphology of Mars, and that water, snow, wave, glacier or artificial modifications of the terrain are nonexistent or at least unimportant. Bands and streaks appear oriented in directions of presumed prevailing winds and curve in conformity with Coriolis force. Volcanic ash carried by winds is also a prominent feature. Seasons vary more than on earth, though its inclination of 24.8° is about the same, its orbit is more eccentric so that vertical incidence insolation is 45% more in summer in the S. Hemisphere than in the N., but summers are much shorter. The atmosphere is rich in CO_2 and argon, but has very little water vapor, some cirrus clouds and many dust storms, a surface pressure of 83 mb and a temperature that occasionally goes above 0°C but often down to −70°C or lower. Eye observation is far superior to photography because of the long exposures (and distortion by surface turbulence) needed to make good large plates. The so-called canals have never been seen with high magnification or on a photograph but only with low magnification telescopes, so seem to disappear when more detail is obtained. Vegetation may exist in its lower forms, but cannot be proven to exist. Wind patterns show much stronger monsoon features than on earth, because there is no tempering ocean area to modify them. Winds are strongest in the southern summer because of the greater heating and darker color of the S. Hemisphere. Canals may be vanes of dark volcanic dust or ash that follow prevailing winds but are not permanent. Clouds of condensed vapor may be seen during supposed volcanic eruptions. *Subject Headings:* **1. Martian atmospheres 2. Martian meteorology.**—*M.R.*

ATMOSPHERIC POLLUTION

See also: **Electrostatic precip.** (Rose, Wood), 8.10–3; **Stack gas diffusion** (Schmidt), 8.10–20; **Polluted air** (Doyle), 8.10–83; **Radioactive fallout** (Herbst, Sommermeyer), 8.10–84.

8.10–121 551.510.42:551.510.41

Altshuller, Aubrey P. (*U. S. Pub. Health Service, Cincinnati*), **Thermodynamic considerations in the interactions of nitrogen oxides and oxy-acids in the atmosphere.** *Air Pollution*

Control Association, Wilmerding, Pa., Journal, 6(2):97–100, Aug. **1956.** 5 tables, 16 refs. **DLC**—Analyses by various authors, involving products of interaction of nitrogen oxides and oxy-acids with each other and with oxygen, ozone, water vapor and ultraviolet light (but not dinitrogen pentoxide or the organic constituents of polluted air) are reviewed. Nitric oxide, nitrogen dioxide and nitric acid are found to be the most prevalent in polluted urban air. From the point of view of chemical meteorology nitrous oxide is of considerable interest. *Subject Headings:* **1. Atmospheric pollution 2. Nitrogen oxides in atmosphere.**—*G.T.*

8.10–122 551.510.42

Effenberger, Ernst and Linder, Arthur, **Statistische Bearbeitung einer einjährigen Grobaerosol-Messreihe.** [Statistical analysis of a one year series of large aerosol measurements.] *Geofisica Pura e Applicata*, Milan, 36:86–93, Jan./April **1957.** 3 figs., 9 tables, 4 refs. **DLC**—Results of daily measurements of large aerosols ($>0.5\mu$) during 1953 and 1954 in Hamburg, using a konimeter at 150 cm above the ground on a busy street from noon to midnight, are worked out by modern statistical methods. The statistical dependence of particle number and size on wind direction, wind speed, and air mass, and the relation between number of large particles and visibility are determined. The mean monthly number of particles varied from 11.5 in July 1954 to 167 (per ml) in Dec. 1953. The highest actual count was 600/ml on Dec. 21, 1953. Dependence on week and on week-day, are also worked out. The part of the variability that was due to each element considered and the residual as well as the regression factors are presented in discussion and table for 12 hr and 24 hr values. *Subject Heading:* **1. Large aerosols.**—*M.R.*

8.10–123 551.510.42

Greenburg, Leonard and Jacobs, Morris B. (*both, Dept. of Air Pollution Control, N. Y. City*), **Air pollution control: health aspects and microtechniques.** *New York Academy of Sciences, Transactions*, 18(4):289–297, Feb. **1956.** 2 tables, 28 refs. **DLC**—In this review article, the author discusses the pollution in New York City; the effect of air pollution on health, as illustrated by the Meuse Valley incident (Belgium), Donora incident (Pa.), Poza Rica incident (Mexico) and the 1952 London incident; sampling of air pollution, including the use of the principle of deposition for sootfall pollution, absorption, penetration, condensation and adsorption; and methods of analysis for estimating sulfur dioxide, sulfur trioxide, carbon monoxide, nitrogen oxides, ammonia, aldehydes, cyanides, ozone, hydrogen sulfide, lead and hydrocarbons. *Subject Headings:* **1. Atmospheric pollution 2. Atmospheric pollution control 3. Public health.**—*I.L.D.*

8.10–124 551.510.42:546.22

Greenburg, Leonard and Jacobs, Morris B., **Sulfur dioxide in New York City atmosphere.** *Industrial and Engineering Chemistry*, 48(9, Pt. 1):1517–1521, Sept. **1956.** fig., 4 tables, 17 refs. **DLC**—A two-year study shows that highest concentrations of sulfur dioxide occur during temperature inversion periods. In all such instances weather conditions extending far beyond the area are the controlling factor. *Subject Headings:* **1. Atmospheric pollution 2. Sulphur dioxide in the atmosphere 3. Temperature inversions 4. New York City.**—*Authors' abstract.*

8.10–125 551.510:42:551.575.1:541.14

Johnston, Harold S. (*Stanford Univ.*), **Photochemical oxidation of hydrocarbons.** *Industrial and Engineering Chemistry*, 48(9, Pt. 1):1488–1491, Sept. **1956.** 3 figs., 13 refs., 40 eqs. **DLC**—"Photochemical reactions in smog produce free radicals which constantly recombine through bimolecular collisions." The steady-state partial pressure of such free radicals is estimated to be 0.3 to 3 p.p.h.m. under conditions prevailing in the Los Angeles Basin, which is 1 to 10% of the partial pressure of the molecular contaminants. This suggests that free radicals themselves are important primary irritants. Their half life with respect to recombination is put at 10 to 100 seconds, long enough for penetration into buildings. *Subject Headings:* **1. Photochemistry of smog 2. Hydrocarbon oxidation 3. Los Angeles, Calif.**—*G.T.*

8.10–126 551.510.42

Meade, P. J. and Pasquill, F., **A study of the average distribution of pollution around Staythorpe.** *Great Britain. Meteorological Research Committee, M.R. Papers,* 1039, Feb. 18, **1957.** 9 p. 5 figs., 5 tables, 5 refs., 6 eqs. Mimeo. **DWB**—SO_2 pollution round Staythorpe was compared by lead peroxide method with fuel consumed, winter 1951/2 to summer 1954, and with winds at Swinderby, 10 mi to N.E. Pollution is expressed by $p = a + b\frac{f(\theta)S}{\bar{u}}$, where a is background pollution, $f(\theta)$ is frequency of wind direction in corresponding octant, S = no. of tons of SO_2 discharged per month, $\bar{u}$ is mean wind speed and b is a function of vertical shape and size of the cloud. Correlation of observed points with straight line .604 in winter and .804 in summer. Standard deviation of cloud 1500 yds from source is 90 yds in winter and 150–180 yds in summer. These results are consistent with others. *Subjects Headings:* **1. Atmospheric pollution 2. Staythorpe, Eng.**—*C.E.P.B.*

8.10–127 551.510.42

†Thomas, Moyer D. (*Stanford Res. Inst.*), **Air pollution review, 1954–1955.** *Industrial and Engineering Chemistry,* Wash., D. C., 48(9, Pt. 1):1522–1527, Sept. **1956.** 96 refs. **DLC**—Continuing the survey of air pollution literature begun by McCabe in 1954, 96 papers covering 1955 and 1956 (with a few papers from other years) are reviewed in sections on general works, analytical methods, various pollutants, effects on plants, odors, the sky skanner, aerosols, chemistry of Los Angeles smog, auto exhausts, and effects on health. *Subject Headings:* **1. Atmospheric pollution 2. Reviews.**—*G.T.*

UPPER ATMOSPHERE—IONOSPHERE

See also: **Ionos. drift measurement** (Harang, Pedersen), 8.10–16; **E layer winds** (Harang, Pedersen), 8.10–16; **Nomenclature of the atmos.** (Flohn), 8.10–46; **Ozone absorption coefficient** (Hearn et al.), 8.10–161; **Shear line formation in upper troposphere** (Lee), 8.10–182; **Ionos. drift** (Jones et al.), 8.10–197; **Ionos. wind measurement** (Reo, M. S.; Rao, B. R.), 8.10–198; **Diurnal variations of elec. conductivity in ionosphere** (Maeda), 8.10–290.

8.10–128 551.510.5(023) 551.508.8:551.501.7(023)

Engel, Leonard, **Mystery of the air we explore.** *New York Times Magazine,* Section 6, April 15, **1956.** p. 27, 62–64. illus. **DLC**—A popular article on the structure, composition and methods of exploring the atmosphere, especially in the highest layers (by ionospheric radio sounding, rockets, satellites, etc.). The jet stream is also discussed and a cross-section showing atmospheric structure to 800 mi and various sounding devices presented. *Subject Headings:* **1. Upper atmospheric structure 2. Upper atmosphere instruments 3. Popular meteorology.**—*M.R.*

8.10–129 551.510.528:551.557.36

Di Benedetto, Felice, **Vento massimo in quota sul Mediterraneo.** [Maximum upper air winds over the Mediterranean.] *Annali di Geofisica,* Rome, 9(3):379–391, July **1956.** 15 figs., 4 refs., 15 eqs. Italian and English summaries p. 391. **DLC**—The theoretical height relative to the maximum geostrophic wind for a polytropic atmosphere is determined. Based on 2,850 thermodynamical diagrams, a graphical representation of percentual frequencies of the height of the maximum wind with respect to the tropopause, 500 and 300 mb surfaces is given. The results of this analysis show some relevant proprieties of the maximum height which are useful for a precise indication of the "economical" level of flight. *Subject Headings:* **1. Tropopause wind maximum 2. Upper air wind analysis 3. Mediterranean Sea.**—*Author's abstract.*

8.10–130 551.510.534

Regener, Victor H. (*Dept. of Physics, Univ. of New Mexico, Alburquerque*), **The vertical flux of atmospheric ozone.** *Journal of Geophysical Research,* Wash., D. C., 62(2):221–228, June **1957.** 3 figs., table, 10 refs. **DLC**—The downward flux of atmospheric ozone near the

earth's surface is evaluated from recordings in Nebraska of the vertical profile of ozone and from simultaneous data on the wind profile and on the shearing stress at the surface. Furthermore, recordings of the ozone concentration in New Mexico at two levels which are 4,000 ft apart in altitude are used, together with the previously determined flux value, for an estimate of the coefficient of exchange in the atmosphere between the two stations. The observed differences in the ozone concentration at the two stations are also examined in relation to wind and temperature. *Subject Headings:* **1. Vertical ozone distribution 2. Ozone concentration 3. Nebraska 4. New Mexico.**—*Author's abstract.*

8.10–131 551.510.534:551.521.61:551.508.25

Walshaw, C. D., **Integrated absorption by the 9.6μ band of ozone.** *Royal Meteorological Society, Quarterly Journal*, 83(357):315–321, July **1957.** 2 figs., 3 tables, 16 refs., eq. **DWB**—Measurements of band absorption of ozone amounts from 0 to 1.5 cm STP at pressures of 10 to 760 mm Hg are tabulated and apparatus described. An empirical equation is fitted. The best fit is given by slightly modified values of the absorption coefficients determined by E. VIGROUX, which have a standard error of 2.4%, but the international network using Dobson spectrophotometers employs the coefficients of NY and CHOONG, which differ considerably. *Subject Heading:* **1. Ozone absorption.**—*C.E.P.B.*

8.10–132 551.510.535:523.75

Sedra, R. N. and Hazzaa, I. B. (*both, Faculty of Science, Cario Univ. Giza, Egypt*), **Effect of radiation from solar flares on the ionosphere and the earth's magnetic field.** *Physical Review*, N. Y., 99(4):1070-1072, Aug. 15, **1955.** 3 figs., table, 5 refs., 5 eqs. Also: AGY, Vaughn, **Ionospheric effects produced by solar flare radiation.** *Ibid.*, 102(3):917, May 1, **1957.** 3 refs. **DLC**—Variation in the earth's magnetic field and the corresponding variations in the ionic density of the F1 layer due to solar flares are recorded. The value of the intensity of ultraviolet radiation before it enters the atmosphere is obtained. The constant relating the ionic density and the accompanying magnetic variation is also estimated. AGY pointed out that UV radiation from solar flares does not produce changes in ion density of E and F1 layers but rather at <100 km. Other deficiencies are noted. *Subject Headings:* **1. Solar flare effects on ionosphere 2. Ultraviolet ionization of upper atmosphere.**—*Authors' abstract, M.R.*

MECHANICS AND THERMODYNAMICS OF THE ATMOSPHERE

See also: **Clear air turbulence** (Keitz), 8.10–105; **Constant pressure charts** (Nania), 8.10–106; **Moisture exchange** (Orlova), 8.10–206.

8.10–133 551.511:551.513

*Montgomery, N. S. (*Dublin*), **Meriodional eddy flux of heat over Valentia Observatory.** *I.U.G.G. Association of Meteorology, Rome, Sept. 1954. Scientific Proceedings.* London, Butterworth, **1956.** p. 453–456. fig., 3 tables, 2 refs. **DWB**—The Valentia radiosonde data of four ascents per day during two periods of one week each have been analyzed in detail to obtain the meridional eddy flux of sensible and latent heat. Excellent agreement was found with the results of other workers. There is evidence of a well marked diurnal variation. *Subject Headings:* **1. Meridional heat flux 2. Valentia, Ireland.**—*Author's abstract.*

8.10–134 551.511.2:551.513.1

Van Mieghem, J., **The energy available in the atmosphere for conversion into kinetic energy.** *Beiträge zur Physik der Atmosphäre, Frankfurt a.M.*, 29(2):129–142, **1956.** 11 refs., 12 eqs. German, English and French summaries p. 129. **DWB**—An expression is found for the available energy without introducing restrictions not included in the definition. It is shown that the formula of E. N. LORENZ (1955) only gives the minimum value of the available energy. The definition of available energy implies the existence of a reference state possessing an extreme (minimum) property. Hydrostatic equilibrium and hydrodynamic equilibrium are successively taken as reference state. *Subject Headings:* **1. Potential energy 2. Kinetic energy.**—*Author's abstract.*

8.10–135 551.511.3:551.515.1:551.515.8

§Kruhl, Heinrich, **Trog, umgebogene Okklusion, sekundäre Kaltfront, 2. Teil.** [Trough, bent back occlusion, secondary cold front, Pt. 2.] *Annalen der Meteorologie*, 7(10/12):353–373, **1955/56.** 25 figs., 7 refs. German and English summaries p. 353. **MH-BH**—Taking the synoptic situation of the 6th and 7th Oct. 1954 for a model the lower and upper cyclogenesis is being investigated. The origin of the trough in the rear of the sea level depression is considered to be caused by the downward motion of the upper vortex. This occurs when parts of the air of the warm-sector in the lower layers pass into the rear of the sea level depression and shove as warm air streaks under the upper air vortex. It is shown that the upper cyclogenesis is effected by dropping from stratospheric into upper tropospheric masses, and part of these masses shoving into the lower troposphere. By this the theories of P. RAETHJEN and E. KLEINSCHMIDT are confirmed. In conclusion there are discussed the synoptic conditions causing dropping or shoving of stratospheric masses into tropospheric. (For Pt. 1, *see* 8.1–183, Jan. 1957, *MAB.*) *Subject Headings:* **1. Cyclone development 2. Storm floods, North Sea (Feb. 1953).**—*Author's abstract.*

8.10–136 551.511.3

van Mieghem, Jacques, **Vorticity transport in the atmosphere. (Summary).** *I.U.G.G. Association of Meteorology, Rome, Sept. 1954, Scientific Proceedings.* London, Butterworth, **1956.** p. 415–430. 6 figs., 16 refs., 12+eqs. **DWB**—The vorticity transport, deduced from the balance form of the vorticity equation, may be resolved into two components: a component in the direction of the air flow and a non-convective component. The non-convective transport is much smaller than the convective transport, but may not be disregarded in regions of strong baroclinity. The behaviour of the vorticity transport in known flow patterns (cold and warm lows and highs, wave disturbances, jet streams and shear lines), the influence of orography, of ascending and descending motions of cooling and heating and of expansion and compression in the redistribution of vorticity are examined in turn. The link between vorticity transport and momentum transport is shown. After a brief remark on the interpretation of a basic equation of the general circulation, the results obtained are extended to the absolute vorticity component normal to an arbitrary (even moving) equiscalar surface. *Subject Headings:* **1. Vorticity transport 2. Vorticity equations.**—*Author's abstract.*

8.10–137 551.511.3:551.558.1:551.576.11

Saunders, P. M., **The thermodynamics of saturated air: a contribution to the classical theory.** *Royal Meteorological Society, Quarterly Journal*, 83(357):342–350, July **1957.** 6 figs., 14 refs., 8 eqs. **DWB**—The equations of reversible and pseudoadiabatic expansion of air saturated with respect to liquid water are set out. Given initial pressure and temperature subsequent states of the air are uniquely determined. Temperatures attained in ice-saturation pseudoadiabatic expansion are up to 2.4°C higher than with water saturation. The water-saturation adiabatic temperature and the saturation adiabats are next discussed. Finally, the effect of the weight of a dispersed condensate of water or ice on the density of saturated air is considered. *Subject Heading:* **1. Thermodynamics of clouds.**—*C.E.P.B.*

8.10–138 551.511.6:551.513

Monin, A. S., **O makroturbulentnom obmene v zemnoĭ atmosfere.** [Macroturbulent exchange in the earth's atmosphere.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 4:452–463, April **1956.** 5 figs. (1 fold.), table, 33 refs., 20 eqs. **DLC**—The characteristics of large scale turbulence analagous to those of small scale turbulence are discussed mathematically and the attempt is made to determine these characteristics of macroturbulence on the basis of data of synoptic charts allowing estimates of the order of magnitude of these characteristics. It is shown that macroturbulence is not always a dissipating factor in the general circulation. The spectrum of oscillation of the zonal circulation of the atmosphere is analyzed. *Subject Headings:* **1. Macroturbulence 2. Zonal circulation.**—*Trans. of author's abstract.*

8.10–139 551.511.6:551.553.11

Nyberg, Alf and Raab, Lars (*both, Swedish Met. and Hydrological Institute*), **An experimental study of the field variation of the eddy conductivity.** *Tellus*, Stockholm, 8(4):472–479,

Nov. 1956. 4 figs., ref., 2 eqs. DLC—By means of thermistors the temperature field is measured in cold air from the sea entering a strongly heated arid surface. The temperature at 1 m level at first increases and then decreases when the air moves further inland. From these measurements the field of the coefficients of eddy conductivity is calculated. The result shows that the eddy conductivity not only increases upwards but also in the horizontal direction being 3–4 times larger half a km from the shoreline than at the sea. In the Appendix a formula is deduced for determining the coefficient of eddy conductivity. In doing this the definition of A_z is somewhat modified considering the fact that the scales of temperature and potential temperature may differ, the difference depending upon the reference pressure of the potential temperature. The error of neglecting the effect of the reference pressure of the potential temperature in the definition of A_z is discussed. *Subject Headings:* **1. Eddy conductivity 2. Sea breeze.**—*Authors' abstract.*

GENERAL CIRCULATION

See also: **Meridional heat flux** (Montgomery), 8.10–133; 8.10–134; **Macroturbulence** (Neonin), 8.10–138; **Pressure variation-atmos. circulation relationships** (Schwerdtfeger, Prohaska), 8.10–178; **Mean monthly wind summary, Hawaiian Is.** (Dean), 8.10–194; **Wind field analysis** (Saltzman, Peixoto), 8.10–199.

8.10–140 551.513

Obuljen, Ante (*Belgrade*), **Die Zirkulation der Erdatmosphäre als ein geophysikalisches Problem.** [Circulation of the earth's atmosphere as a geophysical problem.] *I.U.G.G. Association of Meteorology, Rome, Sept. 1954, Scientific Proceedings.* London, Butterworth, **1956.** p. 272–276. **DWB**—The author discusses the reason why planetary atmospheres possess a greater rotation than the planets themselves and the cause of this difference in angular velocity and attempts to explain the differences of zonal circulation in the middle and higher latitudes and the origin and formation of the general atmospheric circulation. *Subject Headings:* **1. General circulation 2. Zonal circulation 3. Planetary atmospheres.**—*I.L.D.*

8.10–141 551.513.1

Lorenz, Edward N., **A study of the general circulation and a possible theory suggested by it.** *I.U.G.G. Association of Meteorology, Rome, Sept. 1954, Scientific Proceedings.* London, Butterworth, **1956.** p. 457–462. 15 refs. **DWB**—A recently completed analysis (V. P. Starr and R. M. White) of two years of data from two circumpolar chains of Northern Hemisphere stations, and one year data from three additional chains, indicates that horizontal eddies transport as much angular momentum, water and energy poleward as is required by the interaction of the atmosphere with its environment. The meridional circulation transports minor amounts of angular momentum and energy. The eddy flux of angular momentum is against the gradient of angular velocity throughout much of the atmosphere, so that kinetic energy is transferred from the eddies to the mean flow. The eddy flux of sensible heat is primarily with the temperature gradient but is against the gradient in the lower stratosphere. These results are part of a theory of the general circulation. It appears that the role of heating is to maintain available potential energy represented primarily by the poleward temperature gradient. The resulting state is unstable so that eddies appear. The potential energy of the mean flow maintains the eddies against dissipative effects, and the eddies maintain the kinetic energy of the mean flow against dissipation effects. *Subject Headings:* **1. General circulation 2. Angular momentum flux 3. Kinetic energy.**—*Based on author's summary.*

8.10–142 551.513.1

Palmén, E., **The mean vertical-meridional circulation in low latitudes of the Northern Hemisphere.** *I.U.G.G. Association of Meteorology, Rome, 1954, Scientific Proceedings.* London, Butterworth, **1956.** p. 409–412. 2 figs. (incl. photo), 4 refs., 4 eqs. **DWB**—The upward flow of angular momentum can be explained satisfactorily only by the "Hadley circulation," which is a mean vertical-meridional circulation whereby the angular momentum is transferred from the surface of the trade wind belt into the upper atmosphere. The author discusses the calculation of the mass of air transported by the vertical-meridional circulation and the total mass of air involved in "the Hadley circulation." *Subject Headings:* **1. Vertical-meridional**

circulation 2. Hadley circulation 3. Angular momentum transfer 4. Northern Hemisphere.—*I.L.D.*

8.10–143 551.513.2:551.552

Tucker, G. B., **Evidence of a mean meridional circulation in the atmosphere from surface wind observations.** *Royal Meteorological Society, Quarterly Journal*, 83(357):290–302, July **1957.** 3 figs., 7 charts, 5 tables, 12 refs., 3 eqs. **DWB**—Charts of zonal and meridional mean velocity for northern hemisphere are given for year, summer and winter; 27 sources of data are listed. Standard errors of individual and mean latitudinal components are given; the latter are small. Profiles of mean velocity components over the oceans and over land and sea combined are given for winter, summer and year; the oceanic values overestimate magnitude of components. The changeover from tropical easterlies to mid-latitude westerlies approximately coincides with the high-pressure ridge but in winter there is a cross-ridge northerly flow of about 1 m/s. Horizontal velocity divergence was calculated; maximum divergence zones were found south of subtropical high pressure belt and in 40–50°N, maximum convergence in 60°N. Upward flux of momentum decreases with height in 15–35°N, increases farther north. *Subject Heading:* **1. Meridional circulation.**—*C.E.P.B.*

8.10–144 551.513.2:551.557.5

§Lee, R., **A method of jet-stream analysis at 300 MB.** *Canada. Meteorological Div., CIR*-2565, TEC-198, Nov. 29, **1954.** 10 p. 4 figs., 5 refs., 5 eqs. **DWB, DLC**—Accurate wind profiles have been obtained from several successful flights through jet streams at 300 mb over the U. S. and the United Kingdom. The analysis of these profiles has led to a composite diagram capable of representing all the observed profiles. In addition, deviations from the computed profiles are readily explained by differences in latitude and streamline curvature. Finally, it is shown how the diagram can be used as a basis for jet-stream analysis of synoptic data. *Subject Headings:* **1. Jet stream analysis 2. Jet stream profiles.**—*Author's abstract.*

8.10–145 551.513.7

Berlage, H. P., **The southern oscillation, a 2–3 year fundamental oscillation of world-wide significance.** *I.U.G.G. Association of Meteorology, Rome, Sept. 1954, Scientific Proceedings.* London, Butterworth, **1956.** p. 336–345. 5 figs., 4 tables. **DWB**—In this study the author attempts "to trace the influence of the Southern Oscillation" which has a theoretical period of 2.33 years, "through parts of the world other than those where it originates." It is suggested that the entire world interplay of periodicities can be reduced to the interaction of only two physically real oscillatory processes, represented by the southern oscillation and solar cycle, the mean period of which is 11.12 years. The rules governing the relation between the yearly sunspot number and the character of the air pressure fluctuations at Djakarta are presented and the results of correlation studies of the yearly pressure variation of numerous stations with air pressure at Djakarta, De Bilt, Chicago and Cape Town are presented. Also the 7-year cycle in world weather is discussed. *Subject Headings:* **1. Southern oscillation 2. Solar cycles 3. Weather cycles.**—*I.L.D.*

ATMOSPHERIC DISTURBANCES

See also: **Hurricane-typhoon story** (Fuerst), 8.10–11; **Hurricane spiral bands** (Senn et al.), 8.10–21; **Study to reduce loss of life and property in hurricanes** (U. S. W. B.), 8.10–23; **Fronts** (Zubian), 8.10–26; **Storm surges** (Harris), 8.10–75; **Surface chart as an aid to tornado forecasting** (Whiting), 8.10–110; **Thunderstorm study, El Paso** (Elser), 8.10–114; **Cyclone development** (Kruhl), 8.10–135; **Depression type pressure waves** (Williams), 8.10–172; **Anticyclones** (Mertsalov), 8.10–177; **Wind structure in frontal zones** (Reed), 8.10–183; **Roll clouds** (Koschmieder, Schulz), 8.10–224; **Health resort climatology** (Halbich), 8.10–277.

8.10–146 550.342:551.515.1/2

Donn, William L., **A case study bearing on the origin and propagation of 2- to 6-second microseisms** *American Geophysical Union, Transactions*, 38(3):354–359, June **1957.** 2 figs., 18 refs. **DWB, DLC**—A study of microseisms recorded at seven east-coastal and island

stations for the hurricane of Sept. 1–13, 1950, helps define the factors involved in the generation and propagation of storm microseisms. This study indicates (1) generation is poor over ocean areas characterized by uniform crustal thickness, and is very efficient over regions of strong thickness gradients; (2) efficient propagation seems limited to the crustal layer in which generation occurs. Further, a theory of microseism generation is proposed which involves the energy of waves breaking at sea as the exciting factor. *Subject Headings:* **1. Microseismic storms 2. Microseism generation 3. Microseism-hurricane relationships.**—*Author's abstract.*

8.10–147 551.515.127:551.509.318(54)

Pisharoty, P. R. and Desai, B. N. (*both, Met. Off., Poona*), **"Western disturbances" and Indian weather.** *Indian Journal of Meteorology and Geophysics*, Delhi, 7(4):333–338, Oct. 1956. fig., 15 refs. **DWB, DLC**—On the basis of synoptic observations in India and vicinity the authors discuss the principal features of the influence of "Western disturbances," which are developments of eastward moving troughs in the extratropical zonal westerlies, upon weather in the India-Pakistan region. The behavior of the westerly disturbances during the winter, hot weather, monsoon and post-monsoon periods is described. *Subject Headings:* **1. Western disturbances 2. Easterly troughs 3. India.**—*I.L.D.*

8.10–148 551.515.23(783)

Barbados Weather Observers' Association, **Hurricane "Janet" at Barbados, Sept. 22, 1955.** A memorandum prepared by the Association and published in the Journal of the Barbados Museum and Historical Society. (1955?) 12 p. tables. **DWB** (M15.2 B228n)—This pamphlet gives details of history of Hurricane "Janet," weather conditions (wind, rain, pressure, etc.), state of sea, damage and warnings issued in first real hurricane to hit Barbados in 57 years (others were in 1780, 1831, and Sept. 10, 1898). Winds were not strong (100–115 mph), rain and flooding not excessive and loss of life confined to 35 people, half of whom were killed by a shelter collapsing. About 8100 small houses were ruined and 20,000 people left homeless. 15,000 small houses were damaged and 200 larger ones seriously damaged. Crops (other than sugar) were severely damaged. *Subject Headings:* **1. Hurricane "Janet" (1955) 2. Hurricane damage reports 3. Barbados, B. W. I.**—*M.R.*

8.10–149 551.515.3:77.9:378.3

Tornado film wins citation. *American Meteorological Society, Bulletin*, 38(5):300, May 1957. **DWB, DLC**—Note on Public Service Citation award made on March 1, 1957 at the Dept. of Commerce in Washington to the United Gas Corporation and the Texas Eastern Transmission Corporation for the 15 minute documentary film "Tornado" which has been shown to 42 million people since Feb. 27, 1956. As a result of the showing, 240 additional communities have taken action to establish local warning networks. F. W. Reichelderfer, who made the award, also presented a Superior Accomplishment Award to Berne P. Hughes, Meteorologist in charge at Shreveport, La. for technical assistance in production of the film. *Subject Headings:* **1. Awards 2. Tornado films. I. Reichelderfer, F. W. II. United Gas Corporation III. Texas Eastern Transmission Corporation IV. Hughes, Berne P.**—*M.R.*

8.10–150 551.515.3(73)

U. S. Weather Bureau, **Average monthly variation in tornado frequency, based on a total of 6970 tornadoes, period 1916–1954.** Wash., D. C., U. S. Weather Bureau, July 1955. map (folded). **DWB** (M15.3 U587ab)—A large map of the United States with histograms pasted on each state showing monthly frequency of tornadoes for period 1916–1954 (39 years) based on 6970 tornadoes. Annual average for U. S. A. was 179.36, for Kansas 23.05; Rhode Island, Utah, Nevada, Delaware, Washington and Oregon 0.15 or less. May and June are months of highest frequency in Northern Plains, April and May in Southern Plains, and March and April in Deep South. *Subject Headings:* **1. Tornado frequency charts 2. United States.**—*M.R.*

8.10–151 551.515.8:551.557.3:551.589.1

Eldridge, R. H., **A synoptic study of West African disturbance lines.** *Royal Meteorological Society, Quarterly Journal*, 83(357):303–314, July 1957. 10 figs., 3 tables, 2 refs.

DWB—Disturbance lines (*D/Ls*) on synoptic charts of Ghana Meteorological Dept. in 1955 are analyzed. Progress of that of May 26–28 is shown at 3 hr intervals, with rainfall map for 27th. Length is <50 to >350 mi, distance traversed up to 2000 mi. Origins are discussed. Speed is 17–45 kt, and generally greater than upper winds. Direction of movement S-NW, normally W. Vigorous *D/Ls* can be traced over the sea. They are a major feature in West African weather; at many stations they bring a large proportion of the rainfall. Upper wind structure is considered in relation to I.T.F.; the area affected by *D/Ls* lies south of the I.T.F. The general features are those of a local thunderstorm, but some of the air may be disposed of upwards and this will account for persistence of medium cloud and other after effects. *Subject Headings:* **1. Squall lines 2. West Africa.**—*C.E.P.B.*

RADIATION AND TEMPERATURE

RADIATION

See also: **Auroral luminescence Tromsö** (Vegard), 8.10–24; **Radiation equilibrium of Mouse** (Goldman, Singer), 8.10–54; **Solar energy** (Heywood), 8.10–69; **Sun and skin protection** (Elschner), 8.10–82; **Radiation measurement during eclipse** (Schüepp), 8.10–94; **Infrared spectroscopy** (Gates), 8.10–99; **Ozone absorption** (Walshaw), 8.10–131; Dew (Monteith), 8.10–219; **Radiation through clouds** (Hinzpeter), 8.10–229; **Heat balance of glaciers** (Untersteiner), 8.10–246; **Microclimat. and regional planning** (Sauberer), 8.10–269; **Auroral emissions** (Bates), 8.10–300.

8.10–152 551.521.1

Bögel, Arnold, **Die direkte Sonnenstrahlung auf Westhänge.** [Direct solar radiation on west slopes.] *Zeitschrift für Meteorologie*, 11(3):70–83, March **1957.** 11 figs., 3 tables, 6 refs., 88 eqs. **DLC**—The formula is first developed without regard to the atmosphere. Daily sums of direct radiation are then calculated for an atmosphere with a transmission coefficient of 0.7 and cloudless sky, for west slopes inclined at 0°, 10°, 20°, 30° and 40°, in lats. 50° and 60° for various declinations. *Subject Heading:* **1. Solar radiation on slopes.**—*C.E.P.B.*

8.10–153 551.521.3:551.593

Feigel'son, E. M. and Pastukhov, V. A. (*Geophys. Inst., Acad. Sci. U.S.S.R.*), **Uproshchennyĭ metod ucheta vytianutykh indikatris v zadachakh atmosfernoĭ optiki.** [A simplified method of calculating the attenuation index in problems of atmospheric optics.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 5:541–548, May **1956.** 6 figs., 4 tables, 6 refs., 23 eqs. **DLC**—A simplified method is presented for solving the problems of the transmission of radiation in a purely diffuse atmosphere with strong attenuation indices of diffusion. *Subject Headings:* **1. Radiation attenuation 2. Atmospheric optics.**—*Authors' abstract.*

8.10–154 551.521.32

Kelly, C. F.; Bond, T. E. and Ittner, N. R., **Sky temperatures in the Imperial Valley of California.** *American Geophysical Union, Transactions*, 38(3):308–313, June **1957.** 7 figs. (incl. photo), 18 refs., eqs. **DWB, DLC**—The cloudless sky in the Imperial Valley is shown to have possibilities as a heat sink for cooling livestock and structures. Measurements with a directional radiometer and other instruments indicated that a point in the north sky 60° above the horizon is usually as cool as, or cooler than, other parts of the sky. North sky temperatures averaged 20° to 30° lower than air temperatures near the ground. The correlation of observed sky temperatures with sky temperatures calculated by Brunt's empirical equation from ground observations was 0.58, highly significant. *Subject Headings:* **1. Sky temperature 2. Imperial Valley, Calif.**—*Authors' abstract.*

8.10–155 551.521.326

†Andrillat, Y. (*Lyons Obs.*), **Les bandes de vibration-rotation de la molécule OH dans le spectre infrarouge du ciel nocturne.** [Molecular OH vibration-rotation bands in the infra-

red spectrum of the night sky.] *Journal de Physique et le Radium*, Paris, 17(5):442–448, May 1956. 39 refs., eqs. **DLC**—A review article in which the author discusses the vibration-rotation bands of the OH molecule in the infrared night sky spectrum (discovery in 1944 by STEBBINS, WHITFORD and SWINGS), lists of observations of bands, theoretical results and comparisons of observed and calculated bands by various authors, laboratory data, studies of intensities, temperatures, heights, diurnal and seasonal variations and emission mechanisms. A good bibliography is included. *Subject Headings:* **1. Night airglow research 2. Night airglow infrared spectrum.**—*M.R.*

8.10–156 551.521.326

Barth, Charles A. and Kaplan, Joseph, **The Herzberg oxygen bands in "air" afterglows and the night air glow.** California. Univ. at L. A. Institute of Geophysics, Contract AF 19(122)-453, Scientific Report, No. 5, May 1, 1956. 26 p. 3 figs., table, 29 refs., 18 eqs. **DWB** (M21.4 C153s)—The ultraviolet $A^3\sum^+_u - X^3\sum^-_g$ oxygen bands have been observed in emission from greenish-white "air" afterglows containing 95–98% nitrogen and 2–5% oxygen. The afterglows were excited by an electrodeless rf oscillator and examined with a grating spectrograph having an f/2 camera and a dispersion of 30 A/mm. The most probable mechanism of excitation of these bands in the afterglow is the two-body reaction $N+O_3 \rightarrow NO+O_2$ which releases 5.47 ev. A comparison of the afterglow spectrogram with an ultraviolet night airglow spectrogram shows that bands arising from higher vibrational levels are more intense in the airglow than in the afterglow. Collisional de-excitation can account for the lower vibrational temperature in the laboratory since the pressure is higher than in the upper atmosphere. The atomic nitrogen-ozone reaction also may occur in the chemosphere between 60 and 90 km and may contribute to the excitation of the night airglow Herzberg bands. The atomic nitrogen at this level could come from daylight predissociation of NO and N_2 and from the twilight dissociative recombination of ionized NO. *Subject Headings:* **1. Night airglow ultraviolet bands 2. Herzberg bands of O_2.**—*Authors' abstract.*

8.10–157 551.521.326:551.593.55:546.33:535.33

†Omholt, A. (*Yerkes Obs., Univ. of Chicago*), **Considerations regarding the sodium lines in the nightglow and twilight.** *Journal of Geophysical Research*, Wash., D. C., 62(2):207–212, June 1957. 24 refs., 7 eqs. **DLC**—Some photochemical processes which may be thought of importance for the emission of the sodium lines in twilight and nightglow are discussed. $Na+O_2+M \rightarrow NaO_2+M$ is taken to be the most important oxidation process. Lack of information about the rate coefficients involved prevents precise quantitative computations, but it is found that photochemical reactions may explain the formation of the emitting layers and the nightglow intensity. However, no satisfactory interpretation of the large seasonal variation has so far been given. Photochemical reactions, as well as photoionization of sodium, seem insufficient to explain the observations. *Subject Headings:* **1. Twilight sodium spectra 2. Night airglow spectrum 3. Sodium lines 4. Photoionization of sodium.**—*Author's abstract.*

8.10–158 551.521.326:535.243

Stewart, D. T., **A spectrophotometric investigation of the air afterglow.** *Journal of Atmospheric and Terrestrial Physics*, 10(5/6):318–319, 1957. fig., 3 refs. **DWB**—The spectral energy distribution of the yellow-green glow emitted when nitric oxide and atomic oxygen combine to form nitrogen dioxide was found to be identical with that of air afterglow, with no obvious banded structure. It had a short wave-length limit at 3700–3800 Å and a flat maximum at 5400–5600 Å. *Subject Headings:* **1. Night airglow 2. Spectrophotometric observations.**—*C.E.P.B.*

8.10–159 551.521.61:551.594.51

Murcray, Wallace B., **A possible auroral enhancement of infra-red radiation emitted by atmospheric ozone.** *Nature*, London, 180(4577):139–140, July 20, 1957. 2 refs. **DWB**—Nocturnal atmospheric emission in near infrared on 9.6μ increased by 18% at 11.55 p.m. on March 26, 1957, immediately after an aurora had moved into the field of the instrument. *Subject Headings:* **1. Infrared radiation 2. Auroral radiation.**—*C.E.P.B.*

8.10–160 551.521.61

Pohl, Wolfgang, **Der Ultrarot-Strahlungsstrom in der freien Atmosphäre.** [Infrared radiation in the free atmosphere.] *Umschau*, 57(15):463–464, Aug. 1, **1957.** 2 figs., 9 refs. **DLC**—Absorption and emission of infrared radiation are described. It is divided into outward radiation A and counter-radiation G. The difference $S=A-G$ is the effective loss or gain of energy, and can be calculated. It was measured with unmanned balloons at Munich in 1954/55; the apparatus is described and results of one of 6 nocturnal ascents to 18 km plotted. S increases with height to just under tropopause, then remains roughly constant. With cloud the curve shows strong banding. The rate of change of temperature with height shows peaks, especially in the stratosphere, due to infrared radiation. *Subject Heading:* **1. Infrared radiation.**—*C.E.P.B.*

8.10–161 551.521.63:551.510.534

Hearn, A. G.; Walshaw, C. D. and Wormell, T. W., **The absorption coefficient of ozone at 3021 Å.** *Royal Meteorological Society, Quarterly Journal*, 83(357):364–366, July **1957.** fig., 4 refs. **DWB**—A new determination of the absolute value of the absorption coefficient of ozone at 3021 Å is described. The value obtained for the decimal absorption coefficient, measured at 20°C, is 3.310 ± 0.009 (cm STP)$^{-1}$. This figure is in excellent agreement with the value for this wavelength obtained by VIGROUX (1953) and may be used with confidence in meteorological applications. *Subject Heading:* **1. Ozone absorption coefficient.**—*Authors' abstract.*

8.10–162 551.521.63

Hinteregger, H. E. (*Geophysics Res. Dir., A. F. Cambridge Res. Center*), **Quantitative intensity measurements in the extreme ultraviolet.** (In: Van Allen, James A. (*ed.*), **Scientific uses of earth satellites.** Ann Arbor, Univ. of Michigan Press, **1956.** p. 166–170. ref.) **DWB, DLC**—Region of EUV (extreme ultraviolet) is defined as that from 1500 Å down to a few Angstroms and hence overlaps UV and soft X-ray region, or range from 8 electron volts up to a few thousand. Equipment for measuring EUV from satellite involving use of a monochromator also involves loss of intensity due to poor reflectivity of gratings in this region, and use of a sensitive thermocouple precludes absolute measurements in EUV because of low overall intensity in that region. However, photoelectric emission (counters) methods are being developed which promise to overcome these difficulties. Details are presented in article. *Subject Headings:* **1. Extreme ultraviolet measurements 2. Satellite observations.**—*M.R.*

8.10–163 523.6:551.521.64

Alfvén, Hannes (*Royal Inst. of Technology, Stockholm*), **On the theory of comet tails.** *Tellus*, Stockholm, 9(1):92–96, Feb. **1957.** 4 figs., 4 refs., 3 eqs. **DLC**—According to BIERMANN's theory the repulsive force in comet tails is due to a corpuscular radiation from the sun. It is shown that some of the difficulties of this theory can be overcome if the assumed radiation consists of beams with a frozen-in magnetic field of the same type as required in the electric field theory of magnetic storms and auroras. The interaction between such a beam and the head of the comet produces an amplified magnetic field which determines the shape of the tail. The high accelerations, which have been observed in the tails may be due to electromagnetic forces. *Subject Headings:* **1. Comet tails 2. Corpuscular radiation.**—*Author's abstract.*

TEMPERATURE

See also: **Satellite temp. calculations** (Goldman, Singer), 8.10–54; **Frost protection** (Gol'sberg), 8.10–60; **Heat supply for tomatoes** (Pobetova), 8.10–62; **Weather effects on residential cooling systems** (Gilkey et al.), 8.10–68; **Inversion effects on atmos. pollution** (Doyle), 8.10–83; **Frost formation, Nanjanad** (Balasubramanian, Bakthavathsalu), 8.10–93; **Temp. forecasting** (Artamonov), 8.10–115; **Turbulence in inversions** (Kazanskiĭ, Monin), 8.10–184; **Wind speed maxima and nocturnal temp. inversions** (Blackadar), 8.10–186.

8.10–164 551.524.33(44)

*Bourgeois, J., **Les oscillations de la température et la notion de la température moyenne.** [Temperature variations and the concept of mean temperature.] *La Météorologie*, Paris,

No. 42:127–131, April/June 1956. 2 tables. **DWB**—Newspaper claims of a 2°C rise in mean annual temperature at Paris since 1880 are refuted by presentation of monthly mean temperature data by 10-year periods since 1894 for 6 stations in France. Comparison of the data suggests a false warming trend at Paris (Saint-Maur), due to lack of homogeneity of exposure. Likewise the claim of winters becoming more moderate is unsubstantiated. *Subject Headings:* **1. Temperature variations 2. Monthly mean temperature data 3. Paris, France.**—*G.T.*

8.10–165 551.524.33:517.512.2

Craddock, J. M., **A contribution to the study of Meteorological Time Series.** *Great Britain. Meteorological Research Committee, M.R. Papers*, 1051, May 6, **1957.** 16 p. 9 figs., tables, 8 refs. 24 eqs. Mimeo. **DWB**—A method is described by which all oscillations lying in a particular wave-band are passed, and those lying outside it are reduced or annulled. It was applied on an electronic computer first to a series of random numbers and then to Kew mean temperatures (daily for 1954, 5-day for 1946–50, monthly for 1921–1950 and 3 monthly 1871–1956). All these showed significant periods. Annual mean temperatures for central England 1698–1952 showed a climatic change and possibly also 11- and 2-year periods. Results for Pennsylvania and Bear Island are contrasted with Kew. *Subject Headings:* **1. Periodogram analysis 2. Temperature periodicities.**—*C.E.P.B.*

8.10–166 551.524.36(797)

*Phillips, Earl L. (*State Climatologist, U. S. W. B., Seattle, Wash.*), **Probable occurrence of freezing temperatures in Washington during the spring and fall.** Seattle, Wash., U. S. W. B., April **1957.** 3 p. map, numerous tables, 11 refs. **DWB** (M24.36 U587p)—Probabilities of light, moderate or severe freezes (32°, 28° and 24°F) occurring 10%–20% . . . 80% or 90% of the time, and the earliest and latest dates of 32°, 28°, 24° and 20°F at 24 representative long-period record stations (mostly cooperative) in Washington State are presented in tables, along with a description of the site or changes in site, and the surrounding topography for each station. In some locations (e.g., Deer Park and Wilbur) there is not even 1 week in midsummer that can be considered absolutely frost-free. On the other hand, many places in western Washington have <28° temperatures only during occasional years. In these cases probabilities are based on years when these temperatures do occur. *Subject Headings:* **1. Freezing temperature probabilities 2. Frost data 3. Washington (state).**—*M.R.*

8.10–167 551.524.36(54)

*Natarajan, K. K. (*Met. Off., Poona*), **A note on the hot days of Bombay, 1878–1955.** *Indian Journal of Meteorology and Geophysics*, Delhi, 7(4):371–376, Oct. **1956.** 4 tables, 5 refs. **DWB, DLC**—A detailed survey of the "heat waves" over Bombay during the months of March, April and May for the period 1878–1955. Data on the number, temperature and date of occurrence of number of moderate and severe heat waves over Bombay for the period, frequency of occurrence of easterly component of upper winds at 1500 and 3000 ft a.g.l. over Bombay and Poona on days of heat waves, etc. are presented. Abnormally hot days were found to be invariably associated with delayed onset of sea breeze and consequent increased insolational heating. On abnormally hot days the upper motion up to 1 km above ground level shows an easterly component with an average value of 4–14 kn, while the normal wind is a westerly component. *Subject Headings:* **1. Heat waves 2. Hot spell frequencies 3. Bombay, India.**—*I.L.D.*

8.10–168 551.524.37:633.1:632.111.3

Efimov, I. T., **Ob ustoĭchivosti pozhnivnykh kul'tur k zamorozkam.** [The frost hardiness of catch crops.] *Meteorologiia i Gidrologiia*, No. 12:39–40, Dec. **1956. DWB, DLC**—The results of field experiments carried out in Rostov Oblast during 1953/54 on the resistance of catch crops to frost under conditions of irrigation during the late fall growing season. The autumnal frost frequency in this area, the duration and intensity of the frost, the relationship of frost resistance of various crops, such as maize, Sudan grass, millet etc. upon irrigation is discussed. Increased irrigation reduced frost resistance among new crops. *Subject Headings:* **1. Frost resistant crops 2. Frost 3. Irrigation effects 4. Rostov Oblast, U.S.S.R.**—*I.L.D.*

SOIL TEMPERATURE

8.10–169 551.525.5:536.24

Scott, Ronald F. (*Arctic Construction and Frost Effects Lab., U. S. Army Engr., Boston, Mass.*), **Estimation of the heat-transfer coefficient between air and the ground surface.** *American Geophysical Union, Transactions*, 38(1):25–32, Feb. **1957.** 4 figs., table, 11 refs., 9 eqs. **DWB, DLC**—For the purposes of programming a computer to predict the depths of freezing and thawing in soils, a simple method is outlined with the appropriate charts for calculating the value of the surface heat-transfer coefficient, based on meteorological information which is normally easily obtainable. All the significant parameters are included, and an account of the investigation leading to the preparation of each chart is given. *Subject Headings:* **1. Soil freezing 2. Soil thawing 3. Heat transfer coefficients.**—*Author's abstract.*

WATER TEMPERATURE

8.10–170 551.526.8

Egorov, V. V., **Termicheskoe rassloenie rapy ozer.** [Thermal stratification in salt lakes.] *Priroda*, Moscow, No. 9:114–115, Sept. **1956.** refs. **DLC**—Several observations made on mineral lakes such as Kok-Chaga on the left bank of the Amu-Dar'ia indicated a temperature inversion in these waters since the surface temperature was lower than that at greater depths. An analysis of the mineral distribution showed the mineralization varied with depth, the surface having a solid sediment of 200 g/l and lower depths 375 g/l. It is believed that the evaporation of water from the surface led to the appearance in the surface film of more concentrated and double complex salts. These, sinking to the bottom because of their weight, retain the temperature acquired at the surface during the formation of more complex salts. *Subject Headings:* **1. Inversions in salt lakes 2. Evaporation from lakes 3. Salt deposits.**—*I.L.D.*

PRESSURE AND WIND

PRESSURE

See also: **Pressure height forecasts** (White), 8.10–25; **Upper air pressure, N. Pole** (Heastie), 8.10–28; **Constant pressure charts** (Nania), 8.10–106; **Wind-pressure variability** (Buell), 8.10–189; **Lee wave theory** (Zierep), 8.10–205.

8.10–171 551.541:551.558.21

Gazzola, Adriano, **Sulla variazione con la quota del parametro l^2 in situazioni di onde da rilievo.** [Variation with altitude of the parameter l^2 in wave situations.] *Rivista di Meteorologia Aeronautica*, Rome, 16(3):21–30, July/Sept. **1956.** 5 figs., eqs. Italian, French, English and German summaries p. 21. **DLC**—A discussion of lee waves in the atmosphere giving the theory, reviewing the recent literature, describing the variations of l^2 with height and analyzing a case of pronounced lee waves in the vicinity of Rome on Feb. 7 and 8, 1956. Several graphs show the variation of l^2 and of temperature and other parameters from the surface to 12 km at 12-hourly intervals for the two days in question. Scorer's (1949 and 1953) l^2 parameter varies with β/u, where β is the static stability derived from the temperature lapse rate, and u is the undisturbed horizontal wind speed. *Subject Headings:* **1. Scorer's l^2 parameter 2. Lee waves 3. Rome, Italy.**—*M.R.*

8.10–172 551.541:551.515.8

§Williams, D. T. (*W. B. Airport Station, Oklahoma City*), **A surface study of a depression-type pressure wave.** *Monthly Weather Review*, Wash., D. C., 82(10):289–295, Oct. **1954.** 12 figs., 7 refs. **DWB, DLC**—A micro- or meso-analysis of a "depression wave" that was evident on the numerous barograph traces in the dense cloud physics network at Wilmington, Ohio on April 7, 1948, reveals the character, rate of movement and associated rainfall, wind, temperature and humidity and relation to pressure jumps and to squall line. Several trough lines crossed the area in a short period as shown on 7 charts made at 5-min intervals from 1300 to 1330 EST on April 7. The overall synoptic chart for the Midwest for 1330 shows the

general synoptic features. It is concluded that the depression wave is not as important as the pressure jump in the generation of tornadoes or severe storms, but may be very important in conjunction with a pressure jump line. *Subject Headings:* **1. Meso-analysis of squall lines 2. Depression waves 3. Pressure jump line 4. Wilmington, Ohio.**—*M.R.*

8.10–173 551.542:517.564.4

Bernhardt, Fritz, **Darstellung einer Luftdruckverteilung durch Kugelfunktionen, Teil I.** [Representation of a pressure distribution by spherical harmonics, Pt. 1.] *Zeitschrift für Meteorologie*, 11(3):65–69, March 1957. 2 figs., 2 refs., 14 eqs. DLC—The method of analysis devised by HAURWITZ and CRAIG is outlined and equations are worked out for long-period means of Northern Hemisphere surface pressure for Jan. Reconstructed and actual distributions are compared. *Subject Headings:* **1. Pressure distribution 2. Spherical harmonics.**—*C.E.P.B.*

8.10–174 551.543(213)

Palmer, Clarence E. and Ohsmtede, William D. (*both, Calif. Univ., Inst. of Geophysics*), **The simultaneous oscillation of barometers along and near the equator.** *Tellus*, Stockholm, 8(4):495–507, Nov. 1956. 12 figs., 14 refs. DLC—Oscillations of surface pressure which, within the observational error, occur at the same time over very large oceanic regions, have been described by FROLOW for the tropical Indian Ocean and the Caribbean. Similar oscillations in the equatorial Pacific are reported and the widespread, presumably planetary, extension of the pressure variations emphasized. Statistical investigation suggests that simultaneous falls of pressure along the equator are associated with solar disturbances. *Subject Headings:* **1. Pressure oscillations 2. Equatorial meteorology.**—*Authors' abstract.*

8.10–175 551.543

Rodewald, Martin, **Eine "barometrische Treppe."** [A "barometric stairway."] *Wetterlotse*, No. 119:141–145, June 1957. 2 figs. DLC—In 5 days barometer rose from 1004 to 1016.6 mb, interrupted by 2 falls a day. Locality and date are left as an exercise for the reader. *Subject Heading:* **1. Pressure variations.**—*C.E.P.B.*

8.10–176 551.543(261)

Rodewald, Martin, **Die nordatlantische Luftzirkulation im März 1957.** [The North Atlantic atmospheric circulation in March 1957.] *Wetterlotse*, No. 116:102–104, April 1957. 2 figs. DLC—March 1957 was a good example of how mean conditions for a month can depart from normal. Icelandic low was greatly intensified and displaced to S; anomaly in 45°N. 30°W.—17 mb. The zone of S.W. winds was displaced to S. and intensified. At O.W.S.E. (35°N. 48°W.) storm frequency was only ⅓ normal, but at D (44°N. 41°W.) it was 24.3%. *Subject Headings:* **1. Pressure anomalies 2. North Atlantic.**—*C.E.P.B.*

8.10–177 551.543.1:551.52:551.515.7(47)

Mertsalov, A. N., **K voprosu o sutochnom khode davleniia.** [Diurnal variation of pressure.] *Meteorologiia i Gidrologiia*, Leningrad, No. 3:34–35, March 1956. 2 refs. DWB, DLC—On the basis of calculations of horizontal wind divergence for the central portion of the quasistationary anticyclone of European U.S.S.R., it was determined that during the second half of the day the wind divergence at the height of the anemometer is 2 m/sec per 100 km greater that during the second half of the night. This corresponds to the actually observed difference of about 1 mb 3 hrs. *Subject Headings:* **1. Diurnal pressure variations 2. Wind divergence 3. Anticyclones 4. U.S.S.R.**—*I.L.D.*

8.10–178 551.543.2:551.513(8,99)

Schwerdtfeger, W. and Prohaska, F., **Análisis de la marcha anual de la presión y sus relaciones con la circulación atmosférica en Sudamérica austral y la Antártida.** [Analysis of the annual variation of pressure and its relation to the atmospheric circulation in southern South America and the Antarctic.] *Meteoros*, Buenos Aires, 5(4):223–237, Oct./Dec. 1955. 12 figs., table, 7 refs., Spanish and English summaries p. 223. DWB—With the aid of charts the author describes the unusual variation of the mean annual barometric pressure in the

southern part of South America and in the Antarctic where as in Tierra del Fuego the maximum and minimum occur during the same period namely Oct. and Nov. respectively. The mean annual and semi-annual pressures are subjected to harmonic analysis and their variation with altitude is considered. The annual oscillation of pressure has an inverse relationship to the temperature at the earth's surface. The semiannual pressure oscillation is caused by the unequal heating of the upper troposphere and is also influenced by zonal currents and by conditions in the Antarctic and middle latitudes. *Subject Headings:* **1. Annual pressure variations 2. Harmonic analysis 3. Atmospheric circulation 4. Southern South America 5. Antarctica.**—*I.L.D.*

8.10–179 551.543.3

†Siebert, Manfred, **Über die gezeitenartigen Schwingungen der Erdatmosphäre.** [Tidal oscillations of the terrestrial atmosphere.] *Germany. Deutscher Wetterdienst. Berichte*, 4(22):65–71, 1956. 3 figs., 20 refs., eqs. DWB, DLC—The author describes the five predominating tidal pressure waves of the atmosphere and attempts a quantitative explanation of these pressure waves. The bases for a theoretical treatment of this problem are presented; from the linearized Eulerian hydrodynamic equations used as equations of motion, the equations of continuity and the first law of thermodynamics is developed, the Laplacian tide equations. The introduction of the factor of thermal excitations is shown. This factor is determined by measurement and harmonic analysis of the daily variation of vertical energy flow associated with radiation and austausch and measurement and harmonic analysis of tropospheric temperature. Various studies on the quantitative determination of pressure wave periods are discussed and a detailed criterion of the resonance theory is presented. It is shown that the effect of radiation is considerably greater than that of conduction so that the pressure waves can be explained without any resonance effects. *Subject Headings:* **1. Pressure waves 2. Pressure oscillations.**—*I.L.D.*

WIND

See also: **Wind estimation** (Seilkopf), 8.10–79.

8.10–180 551.55:551.578.1

Holland, J. D., **Relationship between surface wind and drizzle at Halifax.** *Canada. Meteorological Div., CIR*-2840, TEC-240, Nov. 7, 1956. 8 p. 2 figs., 5 tables, 8 refs. DLC—Weather observations at Halifax over the period 1949–54 were analyzed to determine the relationship between the surface wind at Halifax and the occurrence of drizzle. It was found that winds from S.W. to E. through S., i.e., light winds off the seas were involved in a high percentage of the occurrences. *Subject Headings:* **1. Surface wind-drizzle relationships 2. Halifax, Nova Scotia.**—*Author's abstract.*

TURBULENCE

See also: **Turbulence over eastern N. Atlantic** (Rohan), 8.10–55; **Clear air turbulence** (Keitz), 8.10–105.

8.10–181 551.551

Davies, D. E., **Clear air turbulence.** *Weather*, 12 7 :233, July 1957. DWB—Description of very severe turbulence at 2000–3000 ft above Lossiemouth, Nov. 27, 1944. *Subject Headings:* **1. Clear air turbulence 2. Lossiemouth, Scotland.**—*C.E.P.B.*

8.10–182 551.551:551.510.528

§Lee, R., **An example of shear-line formation in the upper troposphere.** *Canada. Meteorological Div., CIR*-2558, TEC-195, Nov. 18, 1956. 15 p. 14 figs., 12 refs., 2 eqs. DWB, DLC—The shear line over the central U. S. on Nov. 1, 1953, is studied from the point of view of structure and development. Associated synoptic features such as fronts, tropopause and surface weather are described. In this case, only the polar front participates in the development. A study of the tropospheric vertical velocities prior to the peak of the development indicates that their magnitudes in the maritime polar air were much smaller ($-2\frac{1}{2}$ cm/sec)

than in the tropical air to the northwest of the shear line (−6 cm/sec). Southeast of the shear line, vertical velocities were positive. An interpretation of the vertical velocity field is made in terms of the vertical circulation about the two associated jet-stream maxima. In particular, evidence for the vertical branch of a direct circulation cell is found in the 12-hr tropopause variations which occurred with the passage of a jet-stream maximum. Finally, a summary of the salient features useable as a guide in wind forecasting for similar situations is given. *Subject Headings:* **1. Shear line case histories 2. Upper air wind forecasting 3. Tropopause analysis 4. Central United States.**—*Author's abstract.*

8.10–183 551.551:551.551.8

Reed, Richard J. (*Univ. of Wash., Seattle, Wash.*), **Detailed wind structure in an intense frontal zone.** *American Meteorological Society, Bulletin*, 38(6):357–359, June **1957.** 4 figs., 4 eqs. **DWB, DLC**—Measurements of elevation and azimuth angles, taken every six seconds by an AN/GMD-1 rawin set, are used to compute the detailed wind structure in an intense frontal zone. It is found that the vertical wind shear is discontinuous at the frontal boundaries as anticipated from the thermal wind equation. *Subject Headings:* **1. Wind structure in frontal zones 2. Vertical wind shear.**—*Author's abstract.*

8.10–184 551.551.2:551.524.4

Kazanskiĭ, A. B. and Monin, A. S., **Turbulentnost' v prizemnykh inversiiakh.** [Turbulence in inversions near the ground.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 1:79–86, Jan. **1956.** 5 figs., table, 7 refs., 18 eqs. **DLC**—The turbulence regime in the atmospheric layer near the ground is investigated with the aid of the theory of similarity which allows the establishment of essentially universal functions for the distribution of wind velocity and temperature with height and also the establishment of asymptotic forms of these functions for small and large elevations. Interpolation formula for constructing nomograms for determining the characteristic of the turbulence regime in any gradient measurements are constructed by means of the equation of the equilibrium of turbulent energy. *Subject Headings:* **1. Turbulence near the ground 2. Turbulence in inversions.**—*Trans. of authors' abstract.*

8.10–185 551.551.5

Farthing, E. D., **Summary of available material relating to high-level clear-air turbulence.** *Trans World Airlines, Inc., Meteorological Technical Bulletin*, No. 57–1, March **7, 1957.** 12 p. fig., 17 refs. *Mimeo.* **DWB**—A review of the salient facts in a score of U. S. and British papers on clear air turbulence leads to the following conclusions: 1) clear air turbulence may occur over any place where there is strong vertical or horizontal shear, or over mountains; 2) it occurs most frequently in winter and spring (peak in April); 3) there is no clear altitude relationship though it often occurs near tropopause or jet streams; 4) it often occurs on polar air side of a jet stream. Suggestions for avoiding, ameliorating or forecasting such turbulence or turbulence effects are set forth. *Subject Headings:* **1. Clear air turbulence 2. High level turbulence.**—*M.R.*

WIND DISTRIBUTION AND VARIATIONS

See also: **Eddy conductivity** (Nyberg, Raab), 8.10–139; **Meridional circulation** (Tucker), 8.10–143.

8.10–186 551.553:551.524.4

Blackadar, Alfred K. (*Dept. of Met. and Oceanog., New York Univ.*), **Boundary layer wind maxima and their significance for growth of nocturnal inversions.** *American Meteorological Society, Bulletin*, 38(5):283–290, May **1957.** 11 figs., 16 refs., 8 eqs. **DWB, DLC**—A sharp maximum is frequently observed at night in the wind speed profile below 3000 ft. The wind speed maximum is usually at the top of the nocturnal inversion, is supergeostrophic, and is often associated with extremely large values of wind shear at low levels. It is shown that the characteristic velocity profile tends to promote an orderly growth of the nocturnal inversion. The supergeostrophic wind speeds suggest that an inertia oscillation is induced when the constraint imposed by the daytime mixing is released by the initiation of an inversion at about

the time of sunset. *Subject Headings:* **1. Wind speed maximum 2. Wind speed profiles 3. Nocturnal temperature inversions.**—*Author's abstract.*

8.10–187 551.553.8(544)

§Sinha, K. L. (*Met. Off., Jodhpur*), **Abnormally strong gusty winds in West Rajasthan on March 15, 1956.** *Indian Journal of Meteorology and Geophysics*, Delhi, 7(4):405–406, Oct. 1956. fig., 2 refs. **DWB, DLC**—The synoptic situation associated with the strong gusty winds was a low pressure connected with a western disturbance. The low intensified into a deep depression which was centered over South Punjab. The pressure departure near the center was of the order of 12 mb from normal. Dust raising winds reaching gale force developed. The winds are described with the aid of an autographic record. The maximum wind velocity was as high as 56 mph. *Subject Headings:* **1. Gales 2. Synoptic conditions for gale force winds 3. West Rajasthan, India.**—*I.L.D.*

SPECIAL WINDS

See also: **Katabatic winds, Antarctica** (Ball), 8.10–31; **Trade wind cumulus** (Malkus), 8.10–225.

8.10–188 551.555:551.43

Wilkins, E. M., **Effects of topography on winds and diffusion conditions at the National Reactor Testing Station.** *Air Pollution Control Association, 48th, Detroit, Mich., May 1955. Proceedings.* pub. [1955]. Section 8. 5 p. 9 figs., 3 refs. **DLC**—The Snake River Valley in the vicinity of the National Reactor Testing Station (NRTS) is 60 mi wide at that spot, but winds are nevertheless subject to complicated orographic effects: a) mountain-valley breezes; b) channeling which causes streamlines to curve even within the grounds (two stations 24 mi apart); c) barrier effect of mountains to west (descending dry winds when westerlies prevail); d) basin effect (stagnant pool of air under certain conditions); e) standing eddy over plain and f) migrating zones of wind shear. Each of these are discussed and effects illustrated by schematic diagrams, annual wind roses, diurnal frequency charts and a synoptic chart showing winds in the Valley counter to strong gradient flow. Smoke plume in photo shows marked, non-turbulent shear just above stack and explosion cloud showing remarkable shear (detached plume). *Subject Headings:* **1. Orographic effects on wind 2. Local wind surveys 3. Snake River Valley, Idaho.**—*M.R.*

8.10–189 551.555.3:551.547.3

Buell, C. E. (*Univ. of Mew Mexico*), **An approximate relation between the variability of wind and the variability of pressure or height in the atmosphere.** *American Meteorological Society, Bulletin*, 38(2):47–51, Feb. 1953. 4 figs., 10 refs., 5 eqs. **DWB, DLC**—The square of the standard deviation of the height (p=constant) or of the pressure (h=constant) and the square of the (vector) standard deviation of the wind are found to be approximately linearly related over large areas and through a deep layer extending well into the lower stratosphere. As a result, some statistical characteristics of the large scale motions of the atmosphere depart markedly from those expected on the basis of turbulence theory. An explanation of the empirical relation between the (vector) standard deviation of the wind and the density of the air is offered. *Subject Headings:* **1. Wind-pressure variability 2. Standard deviation computation 3. Turbulency theory.**—*Author's abstract.*

8.10–190 551.555.9

Wehner, H., **Zur Entstehung des Südsüdost-Windes im Elbtal.** [The origin of the south-south-east wind in the Elbe valley.] *Zeitschrift für Meteorologie*, 11(3):83–87, March 1957. 2 figs., 6 refs. **DLC**—A strong SSE wind often blows all day in the Elbe valley, mainly in Nov.–Feb. Of 201 days classified according to weather type, 120 were anticyclonic; Dec. 1–5, 1948, is used as an example. The gradient wind was WNW–WSW; in the Elbe Valley in a cold current from SSE temperature fell by up to 6°C. The wind is attributed to a jet effect between Erzgebirge and Isergebirge. *Subject Headings:* **1. Local winds 2. Elbe Valley, Germany.**—*C.E.P.B.*

WIND EFFECTS

See also: **Wind driven current penetration** (Fomin), 8.10–74; **Wind effects on shallow water** (Welander), 8.10–80; **Wind effects on point discharges** (Kirkman), 8.10–295; **Wind effects on point discharges** (Large, Pierce), 8.10–296.

8.10–191 551.556.4:551.311.3

*Ford, Edwin F. (*Harvard Univ., Cambridge, Mass.*), **The transport of sand by wind.** *American Geophysical Union, Transactions*, 38(2):171–174, April **1957.** 4 figs., 3 refs., 20 eqs. **DWB, DLC**—The problem of the motion of an individual sand grain in wind is subjected to a physical-mathematical analysis. An empirical equation is obtained for observed wind-velocity profiles near the ground. The behavior of a sand grain in such a wind velocity gradient is assumed to be the result of three principal forces: the viscous drag of the air, the force of gravity, and the aerodynamic lift. Differential equations are set up on this basis. When solved by approximate methods for an average sand grain and for the profile obtained in a small wind tunnel, these equations give sand grain trajectories that agree fairly well with the trajectories observed and photographed in the wind tunnel. *Subject Headings:* **1. Sand transport 2. Wind velocities 3. Wind tunnel experiments.**—*Author's abstract.*

8.10–192 551.556.4:551.311.3

Grosse, Bernhard, **Die Erodierbarkeit von Böden durch Wind.** [Wind erosion of the soil.] *Geologisches Jahrbuch*, Hannover, 71:527–530, **1956.** table, 8 refs. **DWB**—Studies of wind movement of fine soil particles on various kinds of surfaces in wind tunnels show that very fine (<.05 mm and especially <.005 mm) as well as large particles (>1 mm) are difficult to move unless wind speeds are high (>15 m/sec), the surface rough or more easily erodable particles are present to help disturb the layer of fine or coarse particles. A formula is presented to express the relation of Reynolds number to wind speed to particle size and viscosity

$$\mathrm{Re} \sim \frac{\text{speed} \times \text{particle size}}{\text{kinematic viscosity}} = V \cdot \frac{d}{v}$$

If Re is <3.5 (i.e. if diam. is <0.03 mm or if wind speed is too low) the viscous air layer hinders the movement of particles and can only be prevented if something disturbs the soil. *Subject Headings:* **1. Wind erosion 2. Soil erosion 3. Wind speed effects on fine soil transport.**—*M.R.*

8.10–193 551.556.4:551.311.3

Sindowski, Karl-Heinz (*Amt für Bodenforschung, Hannover, Germany*), **Korngrössen- und Kornformen-Auslese beim Sandtransport durch Wind (nach Messungen auf Norderney).** [Particle-size and shape sorting by means of sand transport by wind according to measurements at Norderney.] *Geologisches Jahrbuch*, Hannover, 71:517–525, **1956.** 5 figs., 8 tables, 12 refs. **DWB**—A nice quantitative study of three phases of sand transport, conducted at Norderney in 1951 and 1953, at heights up to 85 cm in natural conditions and during 1954 in a wind tunnel, is presented. Sorting by (a) size, (b) shape and (3) relation of wind speed to amount of sand transported, are treated separately. Speed of movement of sand particles of various diameters is shown to vary tremendously with height to which particles are raised by the wind. Except when ground is rough, the relative movement at 1, 5 and 10 cm height is about 17:3.5:1, independent of wind speed. The greatest volume of sand is transported at a height of 0–1.5 cm. Except at crests of dunes with sharp edges, little sand is transported at heights of 1 m or more. Sorting under steady wind conditions is marked, depending on particle shape, mineral composition, and wind speed. Spherical particles are raised the highest and carried the farthest. *Subject Headings:* **1. Wind sorting of sand particles 2. Sand transport by wind 3. Norderney, Germany.**—*M.R.*

UPPER AIR WINDS

See also: **Upper air winds, Mediterranean** (Di Benedetto), 8.10–129; **Jet stream analysis** (Lee), 8.10–144; **Squall lines, W. Africa** (Eldridge), 8.10–151.

8.10–194 551.557:551.513

Dean, Gordon A. (*Florida State Univ.*), **1955 mean monthly wind summary along reconnaissance track northwest of Hawaiian Islands at 500 mb.** *Monthly Weather Review, Wash.,*

D. C., 84(10):353–362, Oct. **1956.** 16 figs., 5 refs. **DWB, DLC**—The mean 1955 monthly variation of the zonal and meridional wind components, and the wind steadiness are presented for the 500 mb level, from 20°–40°N. in the longitude of the Hawaiian Islands. The basic wind information used in the construction of these charts was obtained from the daily weather reconnaissance flight on the track designated "Petrel Foxtrot." Mean monthly 500 mb wind charts were also prepared for the Hawaiian Islands area from the same wind sample. *Subject Headings:* **1. Zonal wind components 2. Meridional wind components 3. 500 mb wind charts 4. Hawaiian Islands.**—*Author's abstract.*

8.10–195 551.557:551.501.7

Fea, G.; Montalto, M. and Gazzola, A., **Analisi obiettiva, a scala sinottica, dei campi di velocità troposferici.** [Objective analysis, on a synoptic scale, of the tropospheric fields of wind speed.] *Rivista di Meteorologia Aeronautica*, Rome, 17(1):3–30, Jan./March **1957.** 9 figs., 12 tables, 4 refs. numerous eqs. Italian, French, English and German summaries p. 3. **DLC**—A technique of approximate graphical analysis of observed wind fields on a synoptical scale, is described here, with a few conclusions concerning the reliability limits of the method. *Subject Headings:* **1. Upper air wind analysis 2. Synoptic analysis 3. Wind speed.**—*Authors' abstract.*

8.10–196 551.557:551.501.7

Henry, T. J. G., **The statistical treatment of upper wind data.** *Canada. Meteorological Div., CIR-*2589, TEC-203, Dec. 15, **1954.** 27 p. 10 figs., 4 tables, 5 refs. **DWB, DLC**—Some possible methods of analysing and presenting upper wind data statistically, on either a month-to-month or a longer-term basis, are briefly surveyed. In both types of summary the vector mean or resultant wind is a useful parameter because of its close relationship to the mean pressure distribution, and it should be supplemented by some parameter which, either by itself or in combination with the vector mean, gives a measure of the vector dispersion. In presenting summaries of long-period data, graphs of cumulative percentage frequency for wind speed without regard to direction, and for wind direction without regard to speed, would seem to be of some value. New types of coordinate paper suitable for this type of representation are described. Transparent overlays, designed with the aid of tables published by C. E. P. Brooks and collaborators, can be used to compare the distribution in direction with that for a normal distribution. The problem of analysing rawin observations for levels affected by low-angle terminations is discussed, and methods of analysis suitable for approximately normal distributions are suggested. *Subject Headings:* **1. Upper air wind analysis 2. Nomograms 3. Vector mean winds.**—*Author's abstract.*

8.10–197 551.557:551.510.535

Jones, I. L.; Landmark, B. and Setty, C. S. G. K., **Movements of ionospheric irregularities observed simultaneously by different methods.** *Journal of Atmospheric and Terrestrial Physics*, 10(5):296–301, **1957.** 4 figs., 2 tables, 11 refs., eq. **DWB**—Velocities of irregularities in ionospheric layers were determined by 4 different methods, one using 3 receivers about one wave-length apart, the others at 3 points about 15 km apart near Cambridge, Eng. Results agree well, showing that large irregularities had the same movements as those which produced ordinary fading. *Subject Heading:* **1. Ionospheric drift.**—*C.E.P.B.*

8.10–198 551.557:551.510.535:551.501.8

Rao, M. Srirama and Rao, B. Ramachandra, **Analysis of fading records from four spaced receivers for ionospheric wind measurements.** *Journal of Atmospheric and Terrestrial Physics*, 10(5/6):307–317, **1957.** 4 figs., 4 tables, 6 refs., 3 eqs. **DWB**—This paper deals with the analysis of fading records from four spaced receivers of pulsed radio waves reflected at vertical incidence from the ionosphere, with a view to finding out the shape of lines of maxima and evolve a better method of calculating wind data. The usual three-station method of measurement of ionospheric winds using average displacements is found to give inaccurate results. It is shown that the method of calculating wind data using median values of displacements gives reliable results. A new and improved method of analyzing wind records for evaluation

of true velocities and direction is also presented. *Subject Heading:* **1. Ionospheric wind measurement.**—*Authors' abstract.*

8.10–199 551.557.2:551.513.1:517.512.1:551.506.7

Saltzman, Barry and Peixoto, José P., **Harmonic analysis of the mean Northern-Hemisphere wind field for the year 1950.** *Royal Meteorological Society, Quarterly Journal*, 83(357): 360–364, July **1957.** 3 figs., 9 refs., 6 eqs. **DWB**—Standing eddies are studied by harmonic analysis of east (U) and north (V) components of mean wind at 500 mb for 1950 along 30°, 45° and 60°N circles. Harmonics most prominent in V are wave number 1 and 2 at 60°, 3, 4 and 5 at 45°, 1, 2 and 6 at 30°. In U most pronounced is 1 (mean vortex not symmetrical with respect to pole). In many cases phase changes from winter to summer. Net meridional transport of angular momentum is northward in 30° and 45°, southward at 60°. *Subject Headings:* **1. Waves in the westerlies 2. Wind field analysis 3. Harmonic analysis of waves.**—*C.E.P.B.*

8.10–200 551.557.3

*U. S. Air Weather Service, **Studies of 2-hour and 4-hour upper-wind variabilities over Nevada.** Its *Technical Report*, No. 105–141, Feb. **1956.** 9 p. 10 tables. **DWB**—Radar wind soundings made at 2 and 4 hourly intervals on 10 selected days from March 15 to May 1, 1954 at 2 sites 21 mi apart over Nevada Proving Grounds analyzed to show variability at 6–14, 16–20, 25–35 and 40–50 thousand feet, for use by analysts and forecasters as well as in evaluation of wind data for ballistics and aeronautics operations. Statistical analysis of regular wind aloft data from Nellis Air Force Base (60 mi SSE) during Feb.–April 1951–53 is included. A total of 344 balloon runs were made (194 at AN/GMD-1A and 150 at SCR584 station). The 10 days were selected to include a wide range of synoptic situations. Vector differences between winds aloft at nearby stations may differ as much as 10 kn and 2-hr changes at the same station may be only a little greater, while 4-hr changes are about 3 kn more than 2-hr changes. Maximum variability occurs in the layer of strongest winds from 25–35 thousand feet. Regression equations to forecast 6 hrs in advance give slight advantage over persistence. *Subject Headings:* **1. Upper air wind variability 2. Nevada Proving Grounds, Nev.**—*M.R.*

8.10–201 551.557.35:551.509.317

Sharp, F. A. and Scott, J. R., **Weather and upper winds at Singapore.** *Royal Meteorological Society, Quarterly Journal*, 83(357):384–386, July **1957.** 3 tables, 3 refs. **DWB**—Referring to Scott's suggestion (*Ibid.*, 82:340–341, **1956**; *see* 7.11–233, Nov. 1956, *MAB*) of a relation between 50,000 ft wind and weather at Singapore, Sharp suggests a relation between maximum wind and rainfall deviation. Days with strong upper wind are more likely to be dry than days with light winds. When rain falls it is for shorter periods. Scott replies that further investigation confirms his earlier results. *Subject Headings:* **1. Upper air winds 2. Short range forecasting 3. Singapore.**—*C.E.P.B.*

8.10–202 551.557.36:551.587(595)

Scott, J. R., **Wind statistics at Singapore.** *Royal Meteorological Society, Quarterly Journal*, 83(357):381–383, July **1957.** table, 4 refs. **DWB**—Weekly radar ascents at Singapore, increasing to daily, from July 1950 to Dec. 1955 are tabulated by seasons 5000–70,000 ft. Up to 30,000 ft σ (standard vector deviation) varies little. From 30,000–50,000 ft $\sigma\rho$=constant. *Subject Headings:* **1. Upper air wind frequencies 2. Singapore.**—*C.E.P.B.*

VERTICAL MOTION

See also: **Thermodynamics of clouds** (Saunders), 8.10–137; **Lee waves** (Gazzola), 8.10–171; **A Cu in a standing wave** (Bird), 8.10–221; **Charged nuclei and subsidence** (Byers), 8.10–289.

8.10–203 551.558.21

Sawyer, J. S. and Hinds, M. K., **Numerical calculations of the airflow over a ridge for small amplitudes.** *Great Britain. Meteorological Research Committee, M.R. Papers*, 1041,

Feb. 26, 1957. 20 p. 11 figs., 11 refs., 37 eqs. Mimeo. **DWB**—The paper treats the problem by numerical analysis and finite differences, allowing more complex variations of wind and stability to be used. The mathematical procedure is set out in appendices. Electronic calculations were carried out for values representing distribution of potential temperature and wind in different air streams. Some of these show large lee-waves, in others lee-waves are not possible because the wind is too high. The number of lee-waves increases with decrease of wind speed. *Subject Headings:* **1. Air flow characteristics 2. Lee waves.** —*C.E.P.B.*

8.10–204 551.558.21

Zierep, Jurgen, **Zur Theorie der instationaren Leewellen.** [Theory of nonstationary leewaves.] *Wissenschaftliche Gesellschaft für Luftfahrt, e.V., Jahrbuch, 1954*, pub. 1955. p. 311–317. 3 figs., 4 refs., numerous eqs. German, English and French summaries p. 317. **DLC** (TL503.W5563). Shortened version issued in *I.U.G.G. Association of Meteorology, Rome, Sept. 1954, Scientific Proceedings.* London, Butterworth, 1956. p. 260–263. 3 figs., 2 refs. **DWB**—The lee waves over obstacles in a flow, changing with time are investigated. It is assumed that the basic flow, i.e., the nonviscous flow over the plane, originally steady, is either accelerated or decelerated. If an obstacle is placed into the basic flow lee waves are formed, which however show unsteady characteristics. These are discussed in detail. *Subject Heading:* **1. Lee waves.**—*Author's abstract.*

8.10–205 551.558.21:551.541

Zierep, Jürgen, **Neue Forschungsergebnisse aus dem Gebiet der atmosphärischen Hinderniswellen.** [Recent results of research in the field of atmospheric lee waves.] *Beiträge zur Physik der Atmosphäre*, Frankfurt a.M., 29(3):143–153, 1957. 2 figs., 9 refs., eqs. German, English and French summaries p. 143. **DWB**—Since the fundamental paper by Lyra, attempts have been made to adapt the assumptions of this theory more and more to real atmospheric conditions. In the present note the upwind solution for a suitable surface obstacle is given immediately as a complex integral, after a critical remark. This is also still possible in the case of the two-layer problem (say troposphere-stratosphere). Following this integral representation the question of uniqueness is treated with the aid of the emission conditions of Sommerfeld. *Subject Heading:* **1. Lee wave theory.**—*Author's abstract.*

AQUEOUS VAPOR HYDROMETEORS AND HYDROMETEOROLOGY

HUMIDITY

See also: **Mechanics of evaporation** (Albertson), 8.10–207.

8.10–206 551.571:551.511

Orlova, V. V., **Vlagooborot vegetatsionnogo perioda zasushlivogo goda v zapadnoĭ Sibiri v sviazi s proiskhozhdeniem osadrov.** [Moisture exchange of the growing period during a drought year in western Siberia in relation to the occurrence of precipitation.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, 50(112):21–38, 1955. 13 figs., 7 tables, 4 refs. **DLC**—An investigation of the summertime moisture exchange during the drought year 1951, in the southern half of western Siberia between 52° and 63°N. lat. and 60° and 84°E. long. The author examines the temperature and precipitation regime during the growing period, the reserves of productive moisture and evaporation for the soil during each month, the atmospheric circulation and direction of moisture leaving air masses, the role of correlation factors, etc. Charts showing the trajectories of the air masses during the individual summer months and tables giving data on moisture transport, moisture content and rate of moisture transport are presented. The precipitation regime and the probability of precipitation are discussed. *Subject Headings:* **1. Soil moisture exchange 2. Moisture transport 3. Precipitation regime 4. Western Siberia.**—*I.L.D.*

EVAPORATION AND EVAPOTRANSPIRATION

See also: **Evapotranspiration measurement** (King et al.), 8.10–100; **Glacial ablation** (Untersteiner), 8.10–246.

8.10–207 551.573:551.571

†Albertson, Maurice L., **La mécanique de l'évaporation, Pt. 1.** [Mechanics of evaporation, Pt. 1.] *La Houille Blanche*, Grenoble, 10(5):704–717, Oct./Nov. **1955. Pt. 2,** *Ibid.*, 11(1):36–52, Jan./Feb. **1956.** In French and English. **Pt. 3,** *Ibid.*, 11(2):282–311, May/June **1956.** 19 figs., 34 refs., 113 eqs. (in 3 articles). All articles in French and English. **DLC.** Thesis, Grenoble Univ., Faculty of Sciences.—A major contribution in the form of a thesis prepared by the author at Grenoble (while on an exchange scholarship), but based on experimental work done since 1945 at Iowa Inst. of Hydraulic Research, at the Climatic Research Lab. at Colorado A. & M. and a model study of the Lake Hefner set up, also made at Colorado A. & M. The physical theory, history of theoretical and empirical work on evaporation from land and ocean, modern concepts of turbulent boundary layers, free and forced convection as developed by Reynolds, Taylor, Von Kármán, Prandtl and others, the laboratory experiments mentioned above (in great detail) and the results of the experiments are treated systematically. It is shown how heat transfer is intimately related to vapor transfer. *Subject Headings:* **1. Evaporation theory 2. Turbulent transfer of moisture.**—*M.R.*

8.10–208 551.573:519.249

Blaney, Harry F. (*Soil & Water Conservation Res. Branch, U. S. Dept. of Agri., Los Angeles*), **Evaporation study at Silver Lake in the Mojave Desert, California.** *American Geophysical Union, Transactions*, 38(2):209–215, April **1957.** 4 figs., 4 tables, 7 refs. **DWB, DLC**—Silver Lake is located in the Mojave Desert north of Baker, Calif. It was formed within a period of three days as a result of a flood in the Mojave River in March 1938. Previously the lake had been dry for several yrs. Its maximum size was 7 mi long and 3 mi wide. After this flood, daily observations were made of temperature, humidity, wind movement, precipitation, and pan evaporation at a Class A Weather Bureau evaporation station established adjacent to the lake, and of changes in water level and temperatures of the lake from May 1938 to April 1939. This paper presents a summary of these measurements. No inflow or outflow occurred during the study and the lake was entirely dry at the end of the following year. Borings in the tight clay lake bottom indicated there were no losses by seepage. The purpose of the study was to determine coefficients for converting pan evaporation to lake evaporation and to develop an empirical relation between evaporation and meteorological factors, under desert conditions. The results show that annual evaporation from Silver Lake was about 79 in. for the period of observation, and that a coefficient of 0.60 could be used in reducing Weather Bureau pan evaporation to lake evaporation in desert areas with similar climate. *Subject Headings:* **1. Evaporation from desert lakes 2. Evaporation from pans 3. Evaporation coefficient 4. Silver Lake, California.**—*Author's abstract.*

8.10–209 551.573:551.578.46

*Groth, Kjell (*Inter. Met. Inst., Stockholm*), **Suppression of evaporation from snow-fields.** *Tellus*, Stockholm, 9(2):159–163, May **1957.** 4 col. plates (photos), 5 tables, 3 refs. **DLC**—An outline is given of the possibilities to utilize surface films for the suppression of evaporation from snow surfaces. Special measures must be taken to ensure the spreading of the films at the low temperatures in question. Preliminary laboratory and field experiments on Stora Lulevatten in Northern Lapland during spring 1954–1956 demonstrated the effect of fatty alcohol films on snow, but definite conclusions as to the ultimate possibilities of the methods and feasibility of their application on a large scale cannot yet be drawn. *Subject Headings:* **1. Evaporation from snow surface control 2. Alcohol films on snow 3. Lapland.**—*Author's abstract.*

8.10–210 551.573(64)

*Loup, Jean, **Note sur l'évaporation au Maroc.** [Note on evaporation in Morocco.] *Revue de Géographie Alpine*, Grenoble, 45(2):351–379, **1957.** 6 figs., 9 tables, refs. **DWB**—The evaporation records from 9 stations in Morocco for 1953–1955 are analyzed and presented

in tables and graphs. The effect of temperature—mainly of the maximum temperature of each day—is said to be the main control. Stations are described; instruments and methods discussed; annual, seasonal, monthly, diurnal and regional, and elevation effects treated; and calculations made by several methods to show comparative accuracy. Part played by evaporation in hydrology of the region is discussed. The highest annual value of evaporation in the U. S. is said to be 2460 mm in the Imperial Valley of Calif. This compares with the record of 2865 mm at Kadoussa (Oct. 1954–Sept. 1955). Records at 6 stations were made with the Houdaille recording evaporimeter, which measures the evaporation under a shelter and not in the free air or that which would occur over a lake where temperature and humidity are modified. Three of the stations on the Sahara side of the Atlas have only the "Colorado" evaporimeter. Here the fragmentary records indicate an annual pan evaporation of 3500–3700 mm (2700–2900 mm or less, actual). *Subject Headings:* **1. Evaporation data 2. Morocco.** —*M.R.*

8.10–211 551.573:628.13

Moulton, K. B., **Evaporation control at Broken Hill.** *Weather*, 12(7):223–225, July **1957.** 2 photos, 2 refs. **DWB**—Stephens Creek Reservoir has a surface area of 2000 acres and a maximum depth of 16 ft; it loses 7 ft/year by evaporation. Cetyl alcohol in solution was fed on to it, the supply being automatically cut off when wind was onshore. Evaporation was reduced by 37% over 14 weeks, representing a saving of 200 million gallons at a cost of 1 d per 1000 gallons. *Subject Headings:* **1. Evaporation control 2. Broken Hill, Australia.**—*C.E.P.B.*

8.10–212 / 551.573:551.579(569.4) 551.482.215.3

Rosenan, N., **Comparison of measured storm water run-off in an intermittent river (Wadi) near Jerusalem with computed water surplus based upon climatological data from Jerusalem.** (In: *International Union of Geodesy and Geophysics. Association of Scientific Hydrology*, **Symposia Darcy, Dijon, Sept. 20–26, 1956, [Proceedings]**, Vol. 3:77–84, **1957?**)—Reprinted as *Israel. Meteorological Service, Series D, Contributions*, No. 9, **1957.** fig., 3 tables, 9 refs.—Surface runoff at Motsa near Jerusalem since 1935/6 (except 1947/8) was compared with computed runoff at Jerusalem. Correlation, omitting 1944/5 and 1951/2, 0.96. An appendix compares dates of first overflow of 'Ein Rogel with Jerusalem rainfall from 1860/1 to 1913/4. *Subject Headings:* **1. Runoff evaluation 2. Well levels 3. Israel.**—*C.E.P.B.*

CONDENSATION

8.10–213 551.574.1:551.576.11

Kaplan, Henry G. (*Aviation Forecaster, U. S. W. B., Laguardia Field, N. Y.*), **An analysis of the freezing precipitation situation of December 10–11, 1954.** *American Meteorological Society, Bulletin*, 37(3):121–124, March **1956.** 5 figs., 4 refs. **DWB**—The synoptic situation associated with the occurrence of freezing drizzle and freezing rain over Ohio, northern Pennsylvania, and interior of N. Y. was characterized by a deep low centered over the Gulf of St. Lawrence with a flow of cold air from the northwest; moderate icing was reported. No freezing precipitation was reported on surface reports either before or after this period; RAOBS indicated no above freezing temperatures either aloft or on the ground during this period. There was some cooling at 250 mb and warming at 700 and 500 mb. Freezing precipitation ceased when the cloud tops ceased lowering. The lowest temperature inside the cloud during the time freezing precipitation was observed was −14°C or higher. The author proposes the use of a curve in which cloud top heights as ordinates and time as abscissas function as an aid in forecasting the beginning and ending of freezing drizzle. *Subject Headings:* **1. Synoptic conditions for freezing drizzle 2. Freezing of cloud droplets 3. Freezing rain forecasting.** —*I.L.D.*

8.10–214 551.574.1:551.509.67

Sänger, Raymund (*Physikalisches Inst. der ETH, Zürich*), **On the structure of ice-forming nuclei.** *Zeitschrift für Angewandte Mathematik und Physik*, Basel, 7(3):213–218, May 25, **1956.** 12 refs. Summary p. 217. **DLC.** Also summary in: Conference on the Scientific Basis of

Weather Modification Studies, Univ. of Arizona, Tucson, April 1956, **Proceedings,** pub. 1956. 2 p.—A critical discussion of various opinions on the icing nucleability of different substances, coming to the conclusion that surface forces must be responsible. Epitaxy, as proposed by WEICKMANN, cannot account for observed facts. WEIGH's theory of the electrical surface double layer seems to be more applicable. *Subject Headings:* **1. Icing nucleability 2. Artificial precipitation.**—*A.A.*

8.10–215 551.574.1:551.594.12

Siksna, R., **On the condensation nuclei about the time of sunrise.** *Geofisica Pura e Applicata*, Milan, 36:104–109, Jan./April **1957.** 3 figs., 10 refs. **DLC**—About sunrise, a marked rise in the number of positively charged nuclei in the surface layers of the atmosphere is noted. This is thought to be due to domestic or industrial pollution, but results of measurements made in summer at Uppsala at 3 heights (5, 25 and 210 cm) show that in a place where pollution is almost nil, there is still an increase after sunrise, especially at 210 cm. This would indicate that the nuclei came from above and not by convection from the ground. Electrical and radioactive elements are also considered and diurnal variations shown graphically. *Subject Headings:* **1. "Sunrise effect" on condensation nuclei 2. Large ions 3. Air-earth current 4. Charged nuclei.**—*M.R.*

8.10–216 551.574.1:546.13

Vittori Antisari, Ottavio (*Osservatorio Scientifico, Monte Cimone, Italy*), **Sur la détermination de la distribution des diamètres des particules atmosphériques de chlorure avec la réaction de Liesegang.** [Determination of the size distribution of atmospheric chloride particles by means of the Liesegang reaction.] *Geofisica Pura e Applicata*, Milan, 31:90–96, May/Aug. **1955.** 4 photos, 5 refs. English summary p. 90. **DWB, DLC**—Methods of determining the ratio between the size of the salt nucleus and the diameter of the Liesegang ring formed in gelatine, are discussed and illustrated. The ratio was found to be unaffected by the size of the nucleus but to differ with type of gelatine. No difference was found between NaCl and $MgCl_2$ ratios and NaCl and KCl are indistinguishable with electron microscope. If particles are small ($<10\mu$) enough they appear square in the microphotographs. Size ratios range from 6.3 to 9.0:1. *Subject Headings:* **1. Chloride nuclei size determination 2. Liesegang nuclei counting method.**—*M.R.*

8.10–217 551.574.1

Volz, E., **Abschätzungen über einige Quellen des atmosphärischen Aerosols.** [Estimation of some sources of atmospheric aerosols.] *Geofisica Pura e Applicata*, Milan, 36:138–147, Jan./April **1957.** 2 figs., 2 tables, 23 refs., 2 eqs. **DLC**—German and English summaries p. 138. A discussion is given of LETTAU's calculation of the Aitken nuclei production by towns and the estimations of the world wide effect of vegetation fires and of other nuclei sources. Sun radiation measurements, made simultaneously inside and outside cities, show that the turbidity factor of the air over towns increases by 4.10^{-4} per sec. From consideration of the population densities, the value of anthropogeneous turbidity production is calculated for greater areas. Radiation measurements for four stations during high pressure weather situations with weak winds over Europe show a good agreement with the calculations. It seems that the mean turbidity over the Northern Hemisphere produced by smoke from vegetation fires has not so great an effect as anthropogeneous aerosol. Attention is given to the importance of an estimation of the turbidity production from the gaseous phase that may play an essential role in cloudy air masses. *Subject Headings:* **1. Nuclei sources 2. Nuclei in city air 3. Turbidity factor.**—*Author's abstract.*

8.10–218 551.574.41

Drimmel, Julius, **Ergänzung zur Arbeit: "Zur Physik der Taubildung an der Erdoberfläche."** [Completion of work: "On the physics of dew formation at the earth's surface."] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 10(1):94–95, **1957.** eqs. **DWB**—In DRIMMEL's article in *Ibid., Ser. A*, 9(3):343–356 (*see* 8.2–218, Feb. 1957, *MAB*) a formula by G. HOFMANN on the thermodynamics of dew formation is discussed. DRIMMEL

here gives a simplified formula for a turbulent saturated atmosphere. *Subject Heading:* **1. Dew formation.**—*C.E.P.B.*

8.10–219 551.574.41:551.584.42:551.521.2

Monteith, J. L., **Dew.** *Royal Meteorological Society, Quarterly Journal*, 83(357):322–341, July **1957.** 10 figs., 6 tables, 36 refs., 9 eqs. **DWB**—Dew formation on short grass [at Harlington, Middlesex] has been studied with a balance, recording weight of condensation, and with filter papers to absorb moisture. Three regimes are distinguished; in the first, daytime evaporation continues and the grass remains dry; in the second, the surface continues to lose weight but the grass becomes wet owing to the partial condensation of water vapour evaporating from the soil; in the third, this loss of weight ceases or there is an increase in weight attributed to condensation of atmospheric water vapour. A distinction is therefore made between 'distillation' of water vapour from soil to grass (1–2 mg cm^{-2} hr^{-1}) occurring on very calm nights through a laminar layer with a transfer coefficient approaching the molecular value; and 'dewfall,' the turbulent transfer of water vapour from the atmosphere, negligible when the wind at 2 m falls below 0.5 m/sec but reaching 3–4 mg cm^{-2} hr^{-1} with stronger winds. This distinction is supported by analysis of the surface heat-budget. On windless nights, since heat flux from the soil and net radiative loss were almost equal, the transfers of sensible and latent heat from the atmosphere were negligible and distillation was of much greater importance than dewfall. Implications for taller crops and warmer climates are briefly considered. *Subject Heading:* **1. Dew.**—*Author's abstract.*

FOG

See also: **Fog, south Finland** (Nurminen), 8.10–17; **Summer fog, San Francisco** (Patton), 8.10–18; **Photochem. of smog** (Johnston), 8.10–125.

8.10–220 551.575.36(541)

*Basu, S. C. (*Regional Met. Center, Calcutta*), **Fog over Upper Assam.** *Indian Journal of Meteorology and Geophysics*, Delhi, 8(1):67–71, Jan. **1957.** 5 tables. **DWB, DLC**—Hourly observation of fog at Gauhati and Mohanbari airports and Tezpur and Dibrugahr pibal stations for 1950–52 are analyzed statistically to show the frequency of time of onset, of occurrence and of simultaneous occurrence at 3 points during each hour (1600–0500). Type of fog and meteorological conditions are also considered. Most of the fog occurs in Nov.–Jan. (Jan. maximum), and from 2200–0300 GMT (maximum frequency from 0000–0200), and with westerly depressions (during clearing spells). Gauhati airfield had the greatest number of occasions of fog in all the winter months. Cases of simultaneous occurrence at all the airports in the upper Brahmaputia (Assam) were rare. Maximum frequency of onset was at 2200–2300 Z (before sunrise). *Subject Headings:* **1. Fog frequencies 2. North Assam, India.**—*M.R.*

CLOUDS

See also: **Calif. stratus** (Patton), 8.10–18; **Contrails from jet planes** (Smith, Diamond), 8.10–22; **Drop size distribution** (Sivadjian), 8.10–101; **Thermodynamics of clouds** (Saunders), 8.10–137; **Freezing of cloud droplets** (Kaplan), 8.10–213.

8.10–221 551.576.1:551.558.2

Bird, L. G., **Altocumulus in a standing wave.** *Meteorological Magazine*, London, 86(1020), 2 p. between p. 176–177, June **1957.** 8 photos, ref. **DWB**—A patch of ACu was stationary between 0914 and 0935 on July 24, 1956, N.E. of Defford, though wind at its level (13–15,000 ft) was 45 knt. Probably formed in a stationary lee wave. *Subject Headings:* **1. Altocumulus clouds 2. Standing waves.**—*C.E.P.B.*

8.10–222 551.576.1:778.38

Koschmieder, H. and Meyer, H. (*Darmstadt*), **Wolkenphotogrammetrie.** [Cloud photogrammetry.] *I.U.G.G. Association of Meteorology, Rome, Sept. 1954, Scientific Proceedings.* London, Butterworth, **1956.** p. 346–356. 6 figs. (incl. photos). **DWB**—The object of cloud photogrammetry is to measure the shape and position of a cloud as a function of time. In

this comprehensive review of this field the author reviews the history of photogrammetry, describes the measurement procedure, the cloud measuring chamber and its operation, evaluation and interpretation of the results obtained. *Subject Headings:* **1. Cloud photogrammetry 2. Cloud chambers 3. History of photogrammetry.**—*I.L.D.*

8.10–223 551.576.11:778.3

Koschmieder, H. and Neumann, H.-G., **Wolken-Reihenbilder, II, Zum Lebenslauf von Quellwolken.** [Cloud picture series, Pt. 2, The life cycle of cumulus clouds.] *Beiträge zur Physik der Atmosphäre*, Frankfurt a.M., 29(3):186–208, **1957.** 25 figs., table, 4 refs. German, English and French summaries p. 186. **DWB**—Cloud sequence pictures, published first in 1942 (for Pt. 1, see *Met. Zeit.*, 58(7):254–255, July 1941), show pictures of a given cloud at equidistant times from one and the same place. In the present paper we are concerned with pictures made with *one* camera. Often a scale can be applied to the pictures with the aid of the cumulus-condensation-level. Then the pictures can be evaluated. Fourteen series of cumulus clouds (mostly life cycles) are shown. They show that the build-up of a dwarf-cumulus takes about as long (roughly 10 min.) as that for a large tower. This suggests that small clouds are connected with small upward velocities, large clouds with large upward velocities. The stationary boundary persists one to two minutes in the most favorable case. The decay depends clearly on the ratio of width to vertical extent. For small values of this ratio the decay lasts about seven minutes, for large ratios about twice as long. *Subject Headings:* **1. Cloud photography 2. Cumulus cloud life cycle.**—*Authors' abstract.*

8.10–224 551.576.1:551.515.8

Koschmieder, H. and Schulz, H., **Wolken-Reihenbilder, III, Wolkenwalzen.** [Cloud picture series, Pt. 3, Cloud rolls.] *Beiträge zur Physik der Atmosphäre*, Frankfurt a.M., 29(3):209–218, **1957.** 11 figs., 5 refs. German, English and French summaries p. 209. **DWB**—An example is given of cloud rolls which are parallel to each other and which have approximately circular cross section. The height has to be determined from meteorological parameters. The further evaluation is made by photogrammetric methods, resulting in values for diameter, length, distance of cloud rolls, and depth of the cloud area. The cloud rolls move with the wind speed prevailing in their layer. *Subject Headings:* **1. Roll clouds 2. Cloud photographs.**—*Authors' abstract.*

8.10–225 551.576.1:551.555.1

Malkus, Joanne Starr (*Woods Hole Oceanog. Inst.*), **Trade cumulus cloud groups: some observations suggesting a mechanism of their origin.** *Tellus*, Stockholm, 9(1):33–44, Feb. **1957.** 7 figs., 4 refs., 7 eqs. **DLC**—On a recent field trip to the western Caribbean, temperature gradients in the surface layers of the trade-wind oceans were found and related to the presence of cumulus cloud groups. The cloud groups generally formed over and slightly downwind of warm spots which were several kilometers in extent along the wind and 0.1–0.3°C in amplitude. Clouds were not found in the absence of warm spots although warm spots were occasionally encountered without clouds. Air circulation, similar to but weaker than those produced by heated land masses, are hypothesized to exist over oceanic warm spots and their magnitude is estimated from previous work on heated islands. Observed differences in low-level moisture structure between clear and cloudy areas may be interpreted in terms of such circulations and their evolution with time. Some suggestions are made concerning the life cycles of trade cumuli. *Subject Headings:* **1. Trade wind cumulus clouds 2. Cumulus cloud formation.**—*Author's abstract.*

8.10–226 551.576.1:551.577.11

Morris, Thomas R., **Precipitation in Arizona cumulus as a function of cloud size and temperature.** *Journal of Meteorology*, 14(3):281–283, June **1957.** 4 figs., 4 refs. **DWB**—Near Tucson, Arizona, 80 clouds were observed with airborne radar and tops measured or estimated. Histograms are given of height of top, depth and cloud-top temperature on occasions of precipitation. The larger the cloud, the greater the probability of precipitation. There is a great increase of precipitation ratio above cloud top height 26,000 ft, cloud depth 14,000 ft. *Subject Headings:* **1. Cloud formations 2. Precipitation formation 3. Arizona.** —*C.E.P.B.*

8.10–227 551.576.1:629.135.2

U. S. Air Weather Service, **Preliminary results of Project Cloud Trail.** Its *Technical Report*, No. 105–132, Feb. **1956.** 23 p. 10 figs., 6 tables, 5 refs. **DWB**—Project Cloud Trail has as its goal the collection of high level weather information by and for jet aircraft (in order to improve forecasts of contrails, cirrus clouds, haze and turbulence at height of jet operations). During 1955, 36 fighter-interceptor squadrons in the U. S. collected data over 23 upper air sounding stations at about 1530Z. Analysis of contrail frequency or probability as a function of temperature at 350, 300, 250, 200, 175 and 150 mb in winter and spring; the climatology of cirrus (height, thickness, sky, coverage in tenths and temperature) in winter and spring; high level turbulence over the U. S., especially in relation to mountain ranges and the jet stream are treated statistically and geographically. High level turbulence was reported on 33% of 1200 flights from Dec.–March. *Subject Headings:* **1. Project Cloud Trail 2. Condensation trail data analysis 3. Cirrus clouds 4. High level turbulence 5. U. S.**—*M.R.*

8.10–228 551.576.11:551.501.81

Changnon, Stanley A. and Bigler, Stuart G. (*both, Illinois State Water Survey*), **On the observation of convective clouds and the radar-precipitation echoes within them.** *American Meteorological Society, Bulletin*, 38(5):279–282, May **1957.** 2 figs., 2 refs. **DWB, DLC**—Data collected in Illinois on the behavior of growing cumulus clouds and their associated radar echoes are reviewed and the results are compared to findings in other regions. It is shown that the data collection techniques used, involving two panoramic cameras and a RHI-type radar, were not too successful in Illinois because of the high cloud density on days of cumulus activity. *Subject Headings:* **1. Convective clouds 2. Radar echoes from clouds 3. Illinois.**—*Authors' abstract.*

8.10–229 551.576.11:551.521.3

Hinzpeter, Hans, **Bemerkung zur Transmission von Wolken.** [Remark on the transmission of clouds.] *Zeitschrift für Meteorologie*, 11(2):40–43, Feb. **1957.** 2 figs., table, 12 refs., 5 eqs. **DLC**—The formulas given in *Zeitschrift für Meteor.*, 9:309, 1955 (*see* 7.6–134), 10:100, 1956 (*see* 7.11–185) and 11:1, 1957, are applied to the transmission of solar radiation through clouds. *Subject Heading:* **1. Radiation transmission through clouds.**—*C.E.P.B.*

8.10–230 551.576.11

Squires, P. (*Div. of Radiophysics, C.S.I.R.O., Sydney, Australia*), **The micro-structure of cumuli in maritime and continental air.** *Tellus*, Stockholm, 8(4):443–444, Nov. **1956.** fig., table, ref. **DLC**—Measurements of drop size distribution in continental cumulus (S.E. Australia) and in maritime cumulus off the east and south coasts of Australia since 1950 and off Hawaii during Oct.–Dec. 1954, show the extremely uneven distribution of cloud drops even when samples are taken every 30 sec in the cumulus clouds. Data for 1st, median, 3rd and maximum (quartile) drop concentration indicate that continental clouds have 7 times as many droplets as do maritime cumulus. Histograms show percentages (for each air mass type) in the various ranges of droplet concentration. Maritime cumulus show very high percentages in a very small range in low concentration (0–250 per cm^3), whereas continental cumuli show low percentages over a very wide range (0–1000 and 12% $>1000/cm^3$). *Subject Headings:* **1. Cumulus cloud microstructure 2. Cloud droplet size distribution 3. Cloud droplet sampling 4. Australia 5. Hawaii.**—*M.R.*

8.10–231 551.576.12:778.3 551.593.54:778.3

Ananthakrishnan, R. (*Regional Met. Center, Sonegaon Airport, Nagpur*), **Appearance of haze and clouds through a polaroid.** *Indian Journal of Meteorology and Geophysics*, Delhi, 8(1):122–124, Jan. **1957.** 3 figs., ref. **DWB, DLC**—Use of polaroid filters produces spectacular results in observation or photography of sky-cloud-haze combinations such as those illustrated (Jan. 19–20, 1950 from Kodaikanal Observatory, 7688 ft s.l.). Rotation of the polaroid 90° produces successive changes in the relative illumination of the sky compared with the cloud and haze. Solar prominances show up bright against a dark sky but dark against the bright sun's disk as shown on other photos (Nov. 1–3, 1951). *Subject Headings:* **1. Po-**

laroid photography of clouds and haze 2. Cloud photography with polaroid 3. Haze photography 4. Kodaikanal Observatory, India.—*M.R.*

8.10–232 551.576.3:551.509.3(42)

Caton, P. G. F., **Occurrence of low layer-type cloud over eastern England in relation to the synoptic situation.** *Meteorological Magazine*, London, 86(1020):161–169, June **1957.** 4 figs., 2 tables, 2 refs. **DWB**—Stratus at Bircham Newton, Mildenhall, Cranfield and Felixstowe in 1944 was classified into 6 groups by amount and base height and related to synoptic situation. Results are plotted as histograms in various ways. Significant features are linkages with warm fronts and level of cloud base rising eastward; S.W. tropical air streams are cloudier than North Sea air. Cloudiness with tropical and polar air depends on direction of arrival, station altitude and wind speed. *Subject Headings:* **1. Stratus frequencies 2. Synoptic studies 3. England.** —*C.E.P.B.*

PRECIPITATION

See also: **Rainfall probabilities, Belgian Congo** (Bultot), 8.10–15; **Rainfall intensities, Arctic regions** (U. S. W. B., U. S. Corps of Engrs.), 8.10–30; **Altitude effects on precip.** (Friedrich), 8.10–64; **Radar rainfall measurements** (Huff et al.), 8.10–87; **Radar precip. echoes,** 8.10–90; **Radar precip. echoes** (Lhermitte), 8.10–91; **Cloud and precip. formation** (Morris), 8.10–226; **Hail frequency** (Thom), 8.10–247; **Precip. measurement** (Gt. Brit. Met. Off.), 8.10–249.

8.10–233 551.577.11:535.371

Kalle, Kurt, **Fluoreszenzmessungen in Niederschlagswässern und in künstlichem Rauhreif.** [Measurements of fluorescence of precipitation waters and of artificial hoar-frost.] *Annalen der Meteorologie*, 7(10/12):374–385, **1955/56.** 4 figs., 2 tables, 11 refs. German and English summaries p. 374. **DWB, DLC**—Aerosol, natural, artificial and organic, is investigated by the photometric measurement of fluorescence produced by irradiation with UV light. Rain over land and sea was most impure but became rapidly purer as it continued. Snow and drift ice showed considerable differences in short distances. Artificial hoar-frost was formed on a flask of freezing mixture at Hamburg and on 3 voyages in the North Sea; maps of distribution are given and show that in general amounts with overcast skies are greater than with clear skies. *Subject Headings:* **1. Fluorescence 2. Precipitation composition.**—*C.E.P.B.*

8.10–234 551.577.32(790/1)

*Lowry, William P. (*Oregon Forestry Dept., Salem*), **Notes on the ending of Oregon's rainy season.** *American Meteorological Society, Bulletin*, 37(8):426–428, Oct. **1956.** 4 figs., 4 tables, 3 refs. **DWB**—The rainy season in Oregon ends abruptly about June 30, at almost exactly the time it begins in Arizona. Raininess indexes (the percentage of stations in the state having precipitation) are worked out for Oregon and for Arizona for June 1–15, June 16–30 and July 1–15 for 1944–53 and compared graphically and in tables. It is shown that the indices are in phase or random in early June, are out of phase in late June and in phase in early July. Temperature and cloudiness conditions, for Salem, Oreg., are also studied statistically to see what relation they have to each other and to the general situation that causes this reversal of climatic pattern about July 1, and the results compared with similar data for Arizona. Maximum and minimum temperatures are analyzed for Bend, La Grande, Medford and Salem in 4 sections of Oregon. *Subject Headings:* **1. Rainfall indexes 2. Cloudiness-temperature relationships 3. Rainy season 4. Oregon 5. Arizona.**—*M.R.*

8.10–235 551.577.33(569.4)

Gabriel, K. R. and Neumann, J., **On a distribution of weather cycles by length.** *Royal Meteorological Society, Quarterly Journal*, 83(357):375–380, July **1957.** 2 figs., 3 tables, 6 refs., 10 eqs. **DWB**—Lengths of wet (dry) spells with a dry (wet) spell preceding or following at Tel Aviv are shown to be independent and to have a geometric distribution. A distribution function is deduced which fits observations of wet and dry spells. Correlation shows lengths of successive wet (dry) and dry (wet) spells to be independent. Modal length of cycles is 4 days. *Subject Headings:* **1. Rainfall cycles 2. Tel Aviv, Israel.**—*C.E.P.B.*

8.10–236 551.577.37:551.311:631.4

*Asar, H. J., **Soil erosion.** *Engineering News*, Lahore, West Pakistan, 1(1):28–37, Feb. 1956. figs., photos., tables. **DWB**—Soil erosion in the Punjab is one of the principal factors in failure of crop production to keep up with the population, which has doubled since 1900. Rainfall ranges from 55 in. in the Rawalpindi District to 15 in. a year in the Attock and Jhelum District, and is unusually heavy in Aug. Chakwal in the Jhelum District had 8–37″ in one day. Bad effects of denuding soil are listed and measures which must be taken to prevent erosion in the upland areas suggested. A table gives the amount and intensity of rainfall at 14 stations in the hilly section of the Punjab. *Subject Headings:* **1. Soil erosion 2. Rainfall intensities 3. Punjab, Pakistan.**—*M.R.*

8.10–237 551.577.37:551.579.4

Boyer, M. C. (*Indiana Flood Control & Water Res. Comm., Indianapolis*), **A correlation of the characteristics of great storms.** *American Geophysical Union, Transactions*, 38(2):233–238, April 1957. 3 figs., 4 tables, 5 refs., 4 eqs. **DWB, DLC**—Four characteristics of a storm are the maximum precipitation at the center, or eye, the duration of the storm rainfall, the areal extent, and the shape. These are generally presented graphically be means of curves of relation between average precipitation and area, determined by volumetric integration outward from the center along isohyetal lines. This paper presents a method whereby storms may be compared by means of a mathematical correlation of the characteristics, which makes possible the combining of area-precipitation curves into a single relation. It was assumed that (1) the distribution of precipitation outward from the eye of the storm is an exponential relation with distance, (2) the isohyetals are geometrically similar, and (3) a characteristic area may be selected for each storm so that the depth-area curves may be reduced to dimensionless terms. These assumptions are combined mathematically into

$$\bar{P}/P_{10} = \frac{1.68}{A/A_{0.5}} \left[1 - e^{-1.09(A/A_{0.5})^{\frac{1}{2}}} (1.09(A/A_{0.5})^{\frac{1}{2}} + 1)\right]$$

in which $\bar{P}$ is the average precipitation, P_{10} is the maximum precipitation at the eye of the storm over ten square miles, A is the area enclosed by an isohyetal, and $A_{0.5}$ is the characteristic area, that within which the average precipitation is one-half the maximum. The validity of the equation was investigated by a study of a number of great storms that have occurred over the central Great Plains region. Curves of relation between depth, area, and maximum precipitation were prepared and a method suggested for the determination of maximum flood-producing storms for use in the design of flood-control works in the central United States. *Subject Headings:* **1. Flood producing storms 2. Areal precipitation 3. Storm rainfall 4. Maximum possible precipitation 5. Great Plains, U. S.**—*Author's abstract.*

8.10–238 551.577.37(943)

*Brunt, A. T. (*Div. Off., Brisbane*), **Maximum possible rainfall, Little Nerang Creek, Queensland.** *Australian Meteorological Magazine*, Melbourne, No. 14:41–52, **Sept. 1956.** 4 figs., 4 tables, 3 refs. **DWB**—A study is made of rainfall intensity in the Little Nerang Creek area, near Springbrook, and some phenomenally high values discussed. Using the methods of maximisation as developed by the Hydro-meteorological Section of the U. S. Weather Bureau, two tropical cyclones are examined and depth duration curves plotted. Use is made of pluviograph data to examine the areal and temporal distribution of rainfall during the cyclone of Feb., 1954. *Subject Headings:* **1. Rainfall intensities 2. Maximum possible precipitation 3. Rainfall depth duration data 4. Little Nerang Creek, Queensland.**—*Author's abstract.*

8.10–239 551.577.37(94)

*Hounam, C. E., **Maximum possible rainfall over the Cotter River catchment.** *Australia. Bureau of Meteorology, Meteorological Study*, No. 10, Jan. **1957.** 19 p. 5 figs., 7 tables, chart (fold.), 6 refs. **DWB**—This study of rainfall over the Cotter Valley is designed to determine the maximum possible amount which could fall under optimum meteorological conditions. The thunderstorm model has been used to derive estimates for relatively short periods whilst for longer periods the basis has been synoptic analyses. The storm of May 1925, which caused

severe flooding in the Murrumbidgee River has provided vital data. In addition figures have been obtained by postulating a storm type likely to bring heavy rain to the catchment and then assessing the rainfall produced when this storm type actually occurred over or near the area. Finally, an envelope curve has been drawn. This indicates that the maximum possible rainfall totals over periods of 4, 8, 12 and 24 hrs are slightly in excess of 8, 11, 13 and 17 in. respectively. *Subject Headings:* **1. Maximum possible rainfall 2. Catchment basins 3. Cotter River Valley, Australia.**—*Author's abstract.*

8.10–240 551.577.37(595)

Mason, D. C., **Torrential rainfall at Royal Air Force station, Tengah.** *Meteorological Magazine*, London, 86(1020):187–188, June **1957.** ref. **DWB**—At Tengah in N.W. Singapore Island on Sept. 16, 1956, 4.67″ fell in a thunderstorm, 4.40″ in 99 min from 0627–0806. Other heavy falls were 4.28″ in 1 hr at Changi on April 20, 1953 and 4.73″ in 1 hr at Kallang on July 28, 1951. *Subject Headings:* **1. Excessive precipitation 2. Tengah, Singapore.**—*C.E.P.B.*

8.10–241 551.577.37

§Oliver, Vincent J. and Shaw, Robert F. (*National Weather Analysis Center, U. S. W. B., Wash., D. C.*), **Heavy warm-sector rains from Illinois to Middle Atlantic Coast, May 26–28, 1956.** *Monthly Weather Review*, 37(5):198–204, May **1956.** 8 figs., 14 refs. **DWB, DLC**—A thorough synoptic case history study of widespread warm sector rains resulting from sustained vertical motion through a moist and convectively unstable air mass. Surface, synoptic, precipitable water surface—400 mb, Showalter's stability index, 1000–700 mb thickness, sea level isallobars and vertical motion charts are presented for the Eastern U. S. for May 27 and 28, 1956. Areas of heaviest rain coincided with areas of greatest low level convergence and cyclonic vorticity. *Subject Headings:* **1. Synoptic case histories 2. Excessive rainfall 3. Eastern United States.**—*M.R.*

RAIN, SNOW AND HAIL

See also: **Snow** (Bell), 8.10–10; **Temp. measurement in snow** (Thams), 8.10–102; **Radioactive snow gages** (Higashi, Itagaki), 8.10–103; **Surface wind-drizzle relationships** (Holland), 8.10–180; **Evaporation from snow** (Groth), 6.10–209.

8.10–242 551.578.11:551.501.81

Atlas, David, **Drop size and radar structure of a precipitation streamer.** *Journal of Meteorology*, 14(3):261–271, June **1957.** 7 figs., table, 21 refs., 8 eqs. **DWB**—A detailed analysis is presented of the structure of an isolated precipitation streamer and of its drop-size history observed at the ground. The pattern aloft and the reflectivity structure through the melting zone are consistent with the release of fully grown graupel (equivalent drop diameters up to 2 mm) from a generating cloud some 2500 ft in depth. A sharp reflectivity increment in the lower layers is shown to exceed that which can occur as a result of raindrop growth in cloud. Instead, the increment is attributed to a horizontal variation in the particle sizes released by the generator and manifested as a vertical reflectivity gradient when carried into the radar beam from the side. Particle trajectories and drop sizes provide auxiliary information regarding the extent, orientation and motion of the parent cloud. Differences in the characteristics of the drop-size spectra from previously established empirical relations are also discussed. A discussion of the "bright band" theory of melting graupel is included. *Subject Headings:* **1. Drop size distribution 2. Radar echoes.**—*Author's abstract.*

8.10–243 551.578.11

*Van der Leeden, P.; Nio, Liem Djan and Suratman, P. C., **Velocity of free falling droplets.** *Applied Scientific Research, Ser. A*, The Hague, 5(5):338–348, **1955.** 6 figs., 2 tables, 7 refs. **DLC**—Velocities of freely falling drops of water, teepool, iso-Octane and hexa-decane of various radii (1.8 to 3.0 mm) were determined by a method described and illustrated and the results tabulated and analyzed with respect to distance fallen (from 1 to 9 m) in stagnant air. Extrapolation of curves gives good agreement with data obtained by others in stagnant air, but differs by as much as 10% from values in balanced upward currents. Reduced surface tension was

obtained by using teepool solution and other low tension substances, leading to conclusion that deformation of the drop increases its resistance appreciably. Also, in stagnant air the drag coefficient is a unique function of the Weber number. And in the region from We 1 to 5 the drag coefficient may be calculated from experimental data on ellipsoids, using HINZE's approximation on deformation, but for We >5 the solution fails due to critical Re being passed. The low critical value of Re is possibly due to sharp bottom edge of droplets. This would account for difference between results in stagnant air and in a balanced upward stream. In the latter case, the Re_{cr} would be lowered by turbulence engendered by the upward current. *Subject Headings:* **1. Drop velocities 2. Drag coefficient of raindrops 3. Webers number 4. Reynolds number.**—*M.R.*

8.10–244 551.578.13:551.501.81

Harper, W. G., **Variation with height of rainfall below the melting level.** *Royal Meteorological Society, Quarterly Journal*, 83(357):368–371, July **1957.** 2 figs., 5 refs. **DWB**—Measurements on 3 cm radar at East Hill on 3 occasions of continuous moderate rain (warm-front conditions) are described. The bright band at the melting layer was uniform in temperature and height. Out of 32 scans 24 showed no change of signal intensity towards the ground, showing that all significant growth of precipitation was at and above melting level. Also issued as *Great Britain. Meteorological Research Committee, M.R. Papers*, No. 984, May 23, **1956.** 11 p. 21 figs., 5 tables, 13 refs., 6 eqs. (*see* 8.1–121, Jan. 1957, *MAB.*) *Subject Headings:* **1. Radar rainfall measurement 2. Rainfall variation with height.**—*C.E.P.B.*

8.10–245 551.578.4:519.2(74)

Thom, H. C. S., **Climatological analysis of snowfall thresholds.** *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B*, 8(2):195–201, **1957.** 3 figs., table, 6 refs., eq. English, German and French summaries p. 195. **DWB**—Probability of first occurrence of d inches or more of snowfall is studied for 5 stations, Portland (Maine) to Lake Placid, and probability functions of threshold dates calculated. From these, quantiles can be obtained directly from a table of normal distribution. (For same paper from different source, *see* 7G–215, July 1956, *MAB.*) *Subject Headings:* **1. Snowfall probabilities 2. United States.**—*C.E.P.B.*

8.10–246 551.311.1:551.578.46:551.52:551.573(235)(54)

Untersteiner, N., **Glazial-meteorologische Untersuchungen im Karakorum. II. Wärmehaushalt.** [Glacial-meteorological observations in the Karakoram, Pt. 2, Heat balance.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B*, 8(2):137–171, **1957.** 9 figs., 8 tables, 36 refs., 6 eqs. German, English and French summaries p. 137–140. **DWB**—A further report of Frankfurt Himalaya Expedition 1955. Day and night observations in summer on Chogo Lungma Glacier are discussed, including ablation, wind velocity at 20, 100 and 300 cm height, temperature at surface, 20 and 100 m and gradient 20–100 cm, humidity at 20 and 100 cm, precipitation, evaporation and short and long wave radiation on firn and bare ice at 4000 and 4300 m. Daily variation of ablation is due mainly (88% over firn, 95% over ice) to radiation. Glacier wind is weak. Mean vertical distribution of wind velocity, temperature and humidity may be logarithmic. Vertical fluxes of real and latent heat are calculated from turbulent adiabatic exchange. The mean daily ablation is calculated as 3.71 cm water from firn in June and 5.71 cm water from ice in July, agreeing well enough with observations. Evaporation is unimportant. Heat budgets of Kärsa Glacier (68°N) and Vernagtferner (47°N) are compared with Chogo Lungma (35°N). (For Pt. 1, *see* 8.6–216, June 1957, *MAB.*) *Subject Headings:* **1. Heat balance of glaciers 2. Glacial ablation 3. Chogo Lungma Glacier, Karakoram Mts. I. Frankfurt Himalaya Expedition, 1955.**—*C.E.P.B.*

8.10–247 551.578.7:551.577.36:551.501.45

*Thom, H. C. S., **The frequency of hail occurrence.** *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B*, 8(2):185–194, **1957.** 5 tables, 13 refs., 20 eqs. English, German and French summaries p. 185–186. Also prepubl. mimeo. paper presented at N. Y. meeting of the American Meteorological Society, Jan. **1956.** 18 p. 5 tables, 13 refs., 20 eqs. Also

issued as *U. S. Advisory Committee on Weather Control, Technical Report*, No. 3, June 1957. 18 p. 5 tables, 13 refs., 20 eqs. **DWB**—Hail occurrence, being a comparatively rare event, is fitted well by the Poisson distribution providing the hail storms are independent. When this condition is not met, hail occurrence follows the negative binomial distribution. A test is given which determines whether the Poisson distribution may be used, or whether the negative binomial is necessary. The parameter of the Poisson distribution is always estimated efficiently by the method of moments. The parameters of the negative binomial distribution, however, are only efficiently estimated by the method of moments under certain conditions; when the method of moments fails, the method of maximum likelihood must be employed. A criterion to determine when this method must be used is given together with the method of obtaining the estimates. The methods presented are illustrated by application to several hail records. *Subject Heading:* **1. Hail frequencies.**—*Author's abstract.*

HYDROMETEOROLOGY

See also: **Ground water obs., central Germany** (Bollmann), 8.10–14; **Forest fire effects on runoff** (Anderson), 8.10–63; **Runoff forecasting** (Beaumont), 8.10–113; **Runoff evaluation, Jerusalem** (Rosenan), 8.10–212; **Flood producing storms** (Boyer), 8.10–237.

8.10–248 551.579

American Geophysical Union. Committee on Runoff, **Report of the Committee, 1955–1956.** *American Geophysical Union, Transactions*, 38(3):379–384, June 1957. 5 figs., 9 refs., eqs. **DWB, DLC**—Discussion is reported at length on runoff from small watersheds with curves for effect of storm sewer suppression (New Jersey), effect of land use on runoff and several double mass plottings for seasonal runoff from various watersheds near Edwardsville, Ill. (1938–1954). *Subject Headings:* **1. Runoff from small watersheds 2. Edwardsville, Ill.**—*M.R.*

8.10–249 551.579:551.501.1:551.577

†Great Britain. Meteorological Office, **Hydrology and British rainfall.** *Meteorological Magazine*, London, 86(1021):205–214, July 1957. 8 photos., 38 refs. **DWB**—This Meteorological Office discussion was opened by A. Bleasdale in London on Feb. 18, 1957 and Edinburgh on March 28. He said that water supply is becoming a dominant factor in industry and standard of living. He dealt first with areal measurement of precipitation, including objective methods and radar. Questions of exposure and shielding were taken up, and rainfall sampling by sloping gages in rugged terrain. Snow and precipitation as dew and fog were discussed. The discussions in London and Edinburgh ranged widely, covering evaporation and runoff as well as precipitation. *Subject Headings:* **1. Hydrology 2. Precipitation measurement.**—*C.E.P.B.*

8.10–250 551.579

*Miller, J. F. and Paulhus, J. L. H. (*both, Hydrologic Services Div., U. S. W. B., Wash., D. C.*), **Rainfall-runoff relation for small basins.** *American Geophysical Union, Transactions*, 38(2):216–218, April 1957. 2 figs., table, 2 refs. **DWB, DLC**—Procedures for computing storm runoff from rainfall for other than very small basins have been in use for many years. A rainfall-runoff relation for a basin of 4.1 sq mi is derived and is found to be applicable to other small basins, namely the Little Falls Branch near Bethesda, Md. and Ralston Creek at Iowa City, Iowa. Relations are shown in tables and nomograms for each of the 52 weeks of the year, for antecedent precipitation indexes of 0–7″, hourly runoff of 0 to 2.8″, and hourly rainfall rates of 0.2 to 2.2″. *Subject Headings:* **1. Rainfall-runoff relationships 2. Runoff from small watersheds.**—*Authors' abstract, M.R.*

8.10–251 551.579

Penchev, P., **Gidrologicheskie issledovaniia v Bolgarii.** [Hydrological investigations in Bulgaria.] *Vsesoiuznoe Geograficheskoe Obshchestvo, Leningrad, Izvestiia*, 88(2):147–154, March/April 1956. **DLC**—The significance of hydrologic studies in the economy of Bulgaria is discussed and the investigations carried out in this field since the end of World War II are

described. A summary is given of the investigations of underground waters and rivers, of limnologic studies, and of the limnologic and oceanographic studies on the Bulgarian coast of the Black Sea. The fundamental problems to be investigated are listed, namely: the underground water balance of Bulgaria, the genetic elements of river flow and the regime of inland waters. *Subject Headings:* **1. Hydrologic studies 2. Underground water 3. Limnological investigations 4. Bulgaria.**—*I.L.D.*

8.10–252 551.579.2:551.579.4

Makarova, T. T., **Vliianie intensivnosti snegotaianiia na formirovanie maksimal'nykh raskhodov vody vesennego polovod'ia.** [The influence of snow melting intensity on the maximum water discharge during spring floods.] *Meteorologiia i Gidrologiia*, Leningrad, No. 1:42–44, Jan. 1956. 2 figs., ref., eq. **DWB, DLC**—The influence of the intensity of snow melting on the formation of maximum water discharges is examined by means of a formula allowing the calculation of the discharge of water for any time interval. The formula developed is

$$Q_m = \frac{i_0}{n}\,(f_m + f_{m-1} - f_{m-2} \ldots + f_{m-n-1})$$

where $\frac{i_0}{n}$—intensity of snow melting, f_1, f_2, f_3, . . . particular area from which water runs off, i_0—the intensity of snow melt in one day. An analysis of conditions at Kaluga on the Oka River is carried out. *Subject Headings:* **1. Snow melt effects on river discharge 2. Snow melt intensity 3. Kaluga, U.S.S.R.**—*I.L.D.*

8.10–253 551.579.2

Uryvaev, P. A., **Akkumuliatsiia talykh vod na poverkhnosti basseĭnov.** [Accumulation of melt water on the surface of basins.] *Meteorologiia i Gidrologiia*, Leningrad, No. 3:37–40, March 1956. fig., 5 refs. **DWB, DLC**—The loss of melt water accumulated on the surface of basins may amount in fields to 30% of the snow storage at the start of snow melting; snow storage being calculated from the precipitation at the date of determination of snow melt to date of beginning of maximum accumulation. In forests the losses are 2–3 times smaller than in fields. The waters accumulating on the surface of basins take part in the formation of spring floods. Hence, when excluded temporarily, these waters regulate but do not reduce flow. *Subject Headings:* **1. Snow melt loss 2. Snow storage 3. Snow melt runoff.**—*I.L.D.*

8.10–254 551.579.4

Sturgis, Samuel Davis, Jr., **Floods.** *American Academy of Political and Social Science, Annals*, 490:15–22, Jan. 1957. table. **DWB**—Floods can occur in almost any river valley at almost any time. They are unpredictable. Flash floods and the sudden failure of dams and other structures offer the greatest threat to life; major sustained floods are most threatening to health. The average annual potential damage to property is estimated at nearly a billion dollars. Even though floods are no worse or more frequent than formerly, they are more costly as the flood plains increase in population and economic development. The flood-control measures of the federal government are described; those completed or authorized will prevent about three fourths of the potential damage under present conditions of flood-plains use. The program is, however, still incomplete. *Subject Headings:* **1. Floods 2. Flood control.** —*Author's abstract.*

8.10–255 551.579.5:581.14

Wadleigh, Cecil H. (*U. S. Soil and Water Conservation Research Branch*), **Soil moisture in relation to plant growth.** *U. S. Dept. of Agriculture, Water: the Yearbook of Agriculture*, 1955:258–361. figs. **DA, DWB**—Article gives curves showing quantitative relations between soil moisture stress expressed in atmospheres, and moisture content of soil; the effect of different amounts of salts in the solution, and relation to rate of plant growth. Wilting percentage and field capacity form the upper and lower limits of the soil's capacity for moisture. As the wilting percentage is approached, the tension or pressure increases astronomically. *Subject Heading:* **1. Soil moisture effects on plants.**—*M.R.*

CLIMATOLOGY AND BIOCLIMATOLOGY

CLIMATOLOGY

See also: **Geog. of living things** (Anderson), 8.10–4; **Prin. of human geog.** (Huntington), 8.10–7.

8.10–256 551.58

Grigor'ev, A. A., **A. I. Voeĭkov i nekotorye zadachi sovremennoĭ klimatologii.** [A. I. Voeĭkov and some problems of contemporary climatology.] (In: Budyko, M. I. (*ed.*), **A. E. Voeĭkov i sovremennye problemy klimatologii.** Leningrad, **1956.** p. 13–17.) **DWB**—After discussing A. I. Voeĭkov's fundamental approach to the study of climate as determined by the radiation balance of the earth's surface, the moisture balance and the distribution of land and water, the author considers the problems of climatology at the present time. These include the formulation of climatic laws, the physical processes involved in the formation of climate as a result of the interaction of the atmosphere with the underlying surface and involving heat and moisture exchange, a physical theory of moisture exchange, etc. *Subject Headings:* **1. Problems in climatology 2. Radiation balance 3. Moisture balance. I. Voeĭkov, A. I.**—*I.L.D.*

CLIMATIC ZONES

8.10–257 551.581:551.585

Shapaev, V. M., **O vnutrizonal'nykh klimaticheskikh granitsakh na territorii SSSR.** [Climatic zones within the limits of the U.S.S.R.] *Meteorologiia i Gidrologiia*, No. 5:8–18, May **1956.** fig., 19 refs. **DWB, DLC**—The author criticizes the various climatic maps of the U.S.S.R. and of the world constructed by B. P. Alisov, pointing out various inconsistencies in the climatic zones of the U.S.S.R. as delineated on different maps and noting that the classification itself is not sufficiently based upon physical atmospheric processes. More suitable criteria for delineating the boundaries of the various climatic regions are those of continentality for the Soviet Arctic, of total radiation for the sub-Arctic, etc. A map showing the distribution of climatic zones over the U.S.S.R. by sectors, oblasts and regions is reproduced and a detailed description of each is given. *Subject Headings:* **1. Climatic zones 2. Climatic classifications 3. U.S.S.R.**—*I.L.D.*

CLIMATE OF PARTICULAR PLACES

See also: **Climate of China** (Cressy), 8.10–5; **Climate of Arctic Ocean** (Herrmann), 8.10–6; **Climate of Africa** (Stamp), 8.10–8; **Climate of central Germany** (Bollmann), 8.10–14; **Summer climate, San Francisco Bay area** (Patton), 8.10–18; **Climate, Arabia** (Rathjens et al.), 8.10–19; **Climate, Heard Island** (Law, Burstall), 8.10–32.

8.10–258 551.582:711.4

Paszyński, Janusz, **Badania klimatu lokalnego dla potrzeb urbanistyki.** [Studies of the local climate for town planning.] *Przegląd Meteorologiczny i Hydrologiczny, Warsaw*, 7(3/4): 141–146, **1954.** In Polish; French summary p. 145–146. **DLC, DWB**—Discusses the best methods of investigating the climatic conditions of areas under consideration for the building of new cities. Such studies are made to determine the characteristic features of the local climate and of the possibilities of their alteration and improvement as a result of construction activity and transformations brought about by man. The study should be based on long period meteorological records and on the analysis of the orographic and hydrographic conditions. Observations should be made in different seasons of the year and in various types of weather, with the aid of Assman psychrometers and wind gages of Robinson type. *Subject Headings:* **1. Local climates 2. Town planning.**—*A.M.P.*

8.10–259 551.582.1(71)

The climate of Canada. *Weatherwise*, Boston, 9(2):56–57, 70, April **1956.** photo. **DWB**—Notes on climate of Canada are provided to show similarity between Canada and the

U. S. The Pacific, Atlantic, Rockies and Prairies run north and south and provide similar conditions for several hundred mi N. and S. of the border. Hot weather (103° at Fort Smith, 95° at Dawson and Mayo) can occur far north of the border. Snow is heavy in eastern Canada (10 ft at Montreal) and winter sports are popular with mean winter temperature of about 15°. Summers are often hot and humid in the East. British Columbia has 2 types of climate; 1) very rainy, but mild, ice free and foggy on coast and 2) dry, but with plenty of water in mountain streams and in the interior valleys. *Subject Headings:* **1. Climate of Canada 2. Canada.**—*M.R.*

8.10–260 551.582.2(789)

*New Mexico. State Engineer Office, **Climatological summary of New Mexico: temperature, 1850–1954; frost, 1850–1954; evaporation, 1912–1954.** Its *Technical Report*, No. 5, **1956.** 277 p. 5 figs., graphs, numerous tables. **DWB**—Mean monthly temperatures and pan evaporation are shown on bar charts; a graphical index shows years when temperature, precipitation and evaporation records were available for scores of stations in the state of New Mexico. Finally, the main body of the report (p. 70–277) consists of the actual monthly and annual data, from the beginning of record (e.g. 1874–1954 for Santa Fe) for mean temperature, frost dates, and evaporation, arranged by counties. Evaporation data are included for 3 stations in Arizona, 6 in Colorado, and 6 in Texas. *Subject Headings:* **1. Climatic data for New Mexico 2. Evaporation data 3. New Mexico. I. U. S. Weather Bureau II. New Mexico. Interstate Stream Commission.**—*M.R.*

8.10–261 551.582.2(789)

*New Mexico. State Engineer Office, **Climatological summary of New Mexico: precipitation 1849–1954.** Its *Technical Report*, No. 6, **1956.** 407 p. 5 figs., graphs, numerous tables. **DWB**—All available U. S. W. B. precipitation records for New Mexico, in several cases dating back to 1849–50, and continuing through 1954, including broken or discontinued records, are tabulated by counties and stations (alphabetically). A series of bar charts shows length of record for each station. Maps of the state show location of all types of stations, annual isohyets in relation to topography, and histograms of mean monthly precipitation for over 20 selected stations. Monthly and annual precipitation for each month of record are given for >600 stations. Average or mean monthly amounts (for period of record) do not appear in tabulations. A total of 157,000 individual values occur in the volumes. *Subject Headings:* **1. Climatic data for New Mexico 2. Precipitation data for New Mexico 3. New Mexico. I. U. S. Weather Bureau II. New Mexico. Interstate Stream Commission.**—*M.R.*

8.10–262 551.582.2(45)

*Bilancini, Raoul, **Tavole climatologiche di alcune stazioni Italiane.** [Climatological tables for some Italian stations.] **Pt. 2, Pesaro, Firenze, Pisa, Livorno, Ancona, Jesi. Pt. 3, Chieti, Roma, Isernia, Napoli, Portici. Pt. 4, Foggia, Bari, Potenza, Taranto, Lecce. Pt. 5, Palermo, Messina, Siracusa, Agrigento, Trapani, Cagliari, Sassari.** *Rivista di Meteorologia Aeronautica*, Rome, 17(1):43–49, (2):34–39, (3):22–27, Jan./March, April/June, July/Sept., Oct./Dec. **1957.** figs., tables, refs. French, English and German summaries. **DLC**—Continuing his tabulation and graphical presentation of climatic data for stations in Italy, the author gives the monthly mean values (1901–1930) of average precipitation amount, number of rain days, average, maximum and minimum monthly mean temperature, absolute maximum and minimum temperature, and average daily cloudiness, for each station listed in the title. (For Pt. 1 containing data for 6 stations in northern Italy [*Riv. di Met. Aeron.*, Oct./Dec. **1956**], *see* 8.8–288, Aug. 1957, *MAB.*) *Subject Headings:* **1. Climatic data 2. Climate of Italy 3. Italy.**—*G.T.*

8.10–263 551.582.2(458)

*De Fiore, O., **Gli elementi del clima a Stromboli.** [Climatic elements at Stromboli.] *Accademia Gioenia di Scienze Naturali, Catania, Atti*, 6 Ser., V. 2, **1936/1937.** 42 p. 6 figs., 8 tables, 4 refs. **DLC**—Stromboli, a volcanic island, is the farthest north of the Liparic Island group lying off the N.E. coast of Sicily. A detailed analytical study based on data for 1910–1932 on pressure, temperature, wind, cloudiness, precipitation, temperature according to wind

direction, pressure and wind and monthly and annual values for each element from beginnin of record. The station was at a height of 30 m above sea on the north coast. *Subject Heading:* **1. Climatic data 2. Analytical climatology 3. Climate of Stromboli 4. Stromboli, Lipa Islands, Sicily.**—*M.R.*

8.10–264 551.582.

†**Liste der aus Tempelhof nach Bad Kissingen überführten Tagebücher von Stationen höherer Ordnung.** [List of daily records of first-order stations, moved from Tempelhof t Bad Kissingen.] n.d. 13 p. Mimeo. **DWB**—List of >300 first and second order station and years of record for which daily records were available which were moved to Bad Kissinge after World War II. *Subject Headings:* **1. Climatic data inventories 2. Bad Kissingen Germany. I. Germany Reichsamt für Wetterdienst. Bibliothek II. Germany. Deutsche Wetterdienst in der U. S.-Zone.**—*M.R.*

8.10–265 551.582.2(469

*Morais, J. Custodio de and Pereira, A. Barata, **Clima de Coimbra; valores anuais e normais dos principais elementos e suas variacoes, 1866–1953.** [Climate of Coimbra: annual an normal values of the principal elements and their variations, 1866–1953.] Coimbra, Tipografi da Atlantida, **1954.** 34 p. 3 figs., 12 tables, 29 refs. (At head of t.p.: *Instituto Geofísic da Universidade de Coimbra.*) **DWB**—Data for Coimbra for 1866–1953 are analyzed, showin long period trend in maximum temperature (1910–15, 19.5; 1946–50, 22.5°C) and in precipita tion (increase in 30 year means from 920 mm in 1874–1903 to 1000 mm from 1912–42). Win frequency tables show increase in westerly winds, and pressure has been lower in July. Soi temperature at 3 m depth of 0.7°C higher and number of frosty days lower (from 22 befor 1900 to 15 after 1940). Analysis is in great detail and actual annual and decadal values o most elements given in tables and graphs. *Subject Headings:* **1. Climate of Coimbra, Portuga 2. Climatic trends 3. Long period records 4. Coimbra, Portugal.**—*M.R.*

CLIMATIC CHANGES

See also: **Climatic changes** (Baxter), **8.10–9.**

8.10–266 551.583.2:551.311.12

†Lungersgauzen, G. F. (*All-Soviet Aerogeological Trust, U.S.S.R.*), **Periodichnost' v izmenenii klimata proshlykh geologicheskikh epokh i nekotorye problemy geokhronologii.** [Periodicity in the climatic variations of past geological epochs and some problems of geochronology.] *Akademiia Nauk SSSR, Doklady*, 108(4):707–710, June 1, **1956.** 23 refs. **DLC**—The author presents new evidence regarding climatic variations during past geologic epochs with periods of 2.7, 3.5, 5–6, 9 and 11-years. The various periods found in the precambrian (Southern Urals), in the carboniferous (Karakal Reva, Tian Shan), varve profiles in Sweden, etc., indicate that the most frequent are those of 3,11 and 25–35 yrs. The planetary correlation of climatic change, the various ice ages, the causes of advance and retreat of the glaciations, the relationship between the history of the earth and cosmic periodicity, etc. are discussed. *Subject Headings:* **1. Climatic changes 2. Ice ages 3. Glaciation 4. U.S.S.R.** —*I.L.D.*

8.10–267 551.583.3:581.16

Stelzer, F. (*Vienna*), **Pollenanalyse und Pälaoklima.** [Pollen analysis and paleoclimate.] *Wetter und Leben*, Vienna, 8(3/4):76–81, **1956.** fig., 9 refs. **DLC**—A general discussion article on the principles and procedures of pollen analysis and upon the evidence for climatic changes and the nature of paleoclimates attainable through pollen analysis. The author discusses pollen distribution, the relationship between forest development and climate, the causes of climatic changes and the climatic changes in Central Europe as indicated by pollen analysis. A generalized pollen diagram for Central Europe is presented. *Subject Headings:* **1. Pollen analysis 2. Climatic changes 3. Paleoclimates 4. Central Europe.**—*I.L.D.*

MICROCLIMATOLOGY

See also: **Dew** (Monteith), 2.10–219; **Mesoanalysis**, 8.10–268.

8.10–268 551.584.2:551.509.31

Mesoanalysis, [Meteorological Office discussion]. *Meteorological Magazine*, London, 86(1020):176–184, June **1957.** fig., 12 refs. **DWB**—Report of a discussion on Jan. 21, 1957, opened by W. D. S. McCaffery, whose opening statement was based mainly on: Fujita, T., Newstein, H. and Tepper, M.; **Mesoanalysis: an important scale in the analysis of weather data** (*see* 7.11–16, Nov. 1956, *MAB*). Mesoanalysis is concerned with systems between 10 and 100 mi at intervals of 1 hr and autographic records. The mid-western U. S. is used as an example, especially June 24–25, 1953, and other details including thunderstorms were discussed. A good discussion followed. *Subject Headings:* **1. Mesoanalysis. I. McCaffery, W. D. S.**—*C.E.P.B.*

8.10–269 551.584.2:711 551.521.1:551.588.2

Sauberer, F. (*Vienna*), **Zum Thema Kleinklimatologie und Landesplanung.** [Microclimatology and regional planning.] *Wetter und Leben*, Vienna, 7(8/11):284–285, **1955. DLC**—The author discusses the construction of insolation maps of particular areas taking into consideration orography and difficulties encountered in the map representation of precipitation and temperature conditions and wind conditions. *Subject Headings:* **1. Regional planning 2. Insolation 3. Orographic effects.**—*I.L.D.*

8.10–270 551.584.41:551.586:612

Beriushev, K. G. and Tuliakova, L. F., **Vliianie mikroklimaticheskikh uslovii stepnogo i lesostepnogo raĭonov Zavolzh'ia Kuibyshevskoĭ oblasti na fiziologicheskie reaktsii cheloveka.** [The influence of microclimatic conditions in the steppe and forest-steppe areas of the Trans-Volga Kuibyshev region on physiological reactions of man.] *Gigiena i Sanitariia*, Moscow, 21(11):8–15, Nov. **1956.** 8 figs., table, ref. **DLC**—The physiological reactions of man to microclimatic conditions and his sensations during the warm season, and during the onset of the "sukhovei" were investigated at two localities in Kuibyshev Oblast, namely the Bol'shoi Glushits district (an almost treeless area unprotected against winds by vegetation) and the bora district (at the southern border of the forest steppe where the Buzulukskov pine forest is located). Daily meteorological observations were carried out over a period of three years in order to determine the microclimatic conditions. Eight weather types, ranging from very strong "sukhovei" to hot humid (approximate air temperature and relative humidity given in a table) weather, were established. The physiological responses of adult healthy individuals and those with circulatory diseases to these microclimatic types were investigated by measuring skin temperature (forehead, chest and fingers of hand), sweat production at these points, pulse rate, respiration rate, body temperature and blood pressure. The warmth sensations of the subjects were determined simultaneously. The results are presented in tables. *Subject Headings:* **1. Physiological climatology 2. Forest microclimatology 3. Steppe climates 4. Sukhovei 5. Bol'shoi Glushits District U.S.S.R. 6. Kuibyshev Oblast, Trans-Volga, U.S.S.R.**—*I.L.D.*

CLIMATIC CLASSIFICATION

See also: **Climatic classification in forestry** (Thornthwaite, Hare), 8.10–65; **Climatic zones, U.S.S.R.** (Shapaev), 8.10–257

8.10–271 551.585

†Flohn, Hermann, **Zur Frage der Einteilung der Klimazonen.** [The problem of classification of climatic zones.] *Erdkunde*, 11(3):161–175, Aug. **1957.** 3 figs., 2 tables, 50 refs. English summary p. 161. **DWB**—"Classification of classifications" begun by T. Bergeron's dynamic classification and illustrated by climatic zones of B. P. Alisov based on air mass. He distinguishes 7 zones ranging from equatorial air to arctic and antarctic. The second type consists of synthetic climatic charts on a dynamic basis. It is illustrated by charts by E. Neef (1954) showing 14 divisions, not zonal, and E. Kupfer (1954), the latter taking account of prevailing wind systems, upper troughs and intertropical convergences. The available material is increasing and has brought in the quantitative study of the heat and water balance

in different zones. THORNTHWAITE's researches are described. Finally, the anomalies in the general circulation resulting from the physical nature of the earth's surface are discussed. *Subject Headings:* **1. Climatic classifications 2. Alisov's classification 3. Neef's classification 4. Kupfer's classification.**—*C.E.P.B.*

8.10–272 551.585:551.588:551.501.9

Swartz, John R. (*U. S. W. B., Wash., D. C.*), **A climatological bench-mark network.** *Weatherwise*, Boston, 9(3):88–89, 106, June **1956.** map. **DWB**—A map of the U. S. shows a score of stations in different parts of the country which have been selected, because of their freedom from urban or changing influences and for length of record, to serve as climatological bench mark stations for studies of climatic changes, urban influences, etc. *Subject Headings:* **1. Climatological bench mark network. 2. U. S. Weather Bureau network 3. United States.** —*M.R.*

8.10–273 551.585.5

Hills, E. Sherbon (*Melbourne Univ. Victoria*), **Regional geomorphic patterns in relation to climatic types in dry areas of Australia.** (In: International Symposium on Desert Research, Jerusalem, May 7–14, 1952, **Proceedings,** p. 355–364, pub. **1953.** 6 figs., 9 refs. Discussion p. 363–364.) **DWB**—The hypothetical concept of cycles of arid and semiarid erosion with the characteristic features of surface and drainage at various stages in various geomorphic and climatic regions are described with the aid of maps showing the climatic types of Australia (Thornthwaite and Köppen classifications) and drainage patterns. The author discusses the physiographic types in dry areas, climatic type, Köppen BWh and Thornthwaite EW, involving the "riverless" area, the Lake Eyre basin and climatic type Köppen BSfk, BSsh, BSsb, BSsk and Thornthwaite DWd associated with the desert sand hills. *Subject Headings:* **1. Climatic classifications 2. Arid zones 3. Australia.**—*I.L.D.*

BIOCLIMATOLOGY

See also: **Aviation medicine,** 8.10–2; **Problems of tropics,** 8.10–35; **Basic concepts of bioclimatology** (Kérdő), 8.10–81; **Ultraviolet radiation effects on skin** (Elschner), 8.10–82; **Physiological climatology** (Beriushev, Tuliakova), 8.10–270.

8.10–274 551.586:612.014.4

Berg, H. (*Prof. of Met., Univ. Cologne*), **La biométéorologie et l'homme.** [Biometeorology and man.] *La Météorologie*, Paris, Ser. 4, No. 41:1–19, Jan./March **1956.** 15 figs., table, 30 refs. French, English and Spanish summaries p. 1. **DWB**—In this discussion of some of the existing data on the relationships between meteorological elements and the physiological and psychological behavior of man, the author discusses the relation of body temperature and environmental temperature, climatic tolerance, climatic limits and comfort climates. The use of the katathermometer, the concept of stimulating climates and the zones of such climates, etc., the relationship between weather and the incidence of various types of diseases such as embolism, föhn symptoms and various aspects of climatic therapy are examined critically. *Subject Headings:* **1. Biometeorology 2. Comfort climate 3. Heat tolerance.**—*I.L.D.*

8.10–275 551.586:612.5:612.65

Schreider, Eugene, **Ecological rules and body-heat regulation in man.** *Nature*, London, 179(4566):915–916, May 4, **1957.** 2 tables, 8 refs. **DWB**—Figures are given of ratio of body weight to body surface, and of length of limbs to weight, and latitude distribution discussed. Increase of limb/weight ratio in warmer regions is confirmed. In a hot room and on a treadmill limb/weight ratio has a significant negative correlation with body temperature. *Subject Headings:* **1. Body heat regulation 2. Bioclimatology.**—*C.E.P.B.*

8.10–276 551.586:612.5:577.4

*U. S. Quartermaster Corps. Research and Development Branch. Environmental Protection Section, **Conference on the principles of environmental stress on soldiers for the purpose of developing a climatic index suitable for mapping purposes for the protection of troops operating in all climates.** Aug. 25, **1944.** Reissued Feb. **1947.** 51 p. 22 figs. (some

fold.), map (fold.), refs.—For the purpose of developing a climatic index for expressing climatic stress, the participants discuss the physical basis of the thermal balance of the human body. The principles of convectional, conductive, evaporative, and radiational heat loss from the human body are presented mathematically. The concept of clo value is considered in relation to clothing insulation and heat loss. Comparisons between an experimental climatic index, the ASHVE effective temperature and Pierce Laboratory Indices are made and illustrated by means of graphs. *Subject Headings:* **1. Climatic indexes 2. Thermal balance of human body 3. Climatic stress.**—*I.L.D.*

8.10–277 551.586:615.834

†Halbich, F., **Heilstätten-Klimatologie.** [Health resort climatology.] *Wetter und Leben*, Vienna, 8(3/4):65–69, **1956.** table, 23 refs. **DLC**—A brief historical summary of the application of climatotherapy to the treatment of tuberculosis in Switzerland, Germany and Austria is presented. An outline is given of procedure for detailed meteorological recordings to be made in connection with climatotherapy. The results of a study of climatotherapeutic observations carried out in May 1954 at the Grafenhof sanitorium are discussed. *Subject Headings:* **1. Resort climatology 2. Medical climatology 3. Tuberculosis 4. Switzerland.** —*I.L.D.*

8.10–278 551.586:628.8

Gaulin, Richard P. (*Public Health Service, Wash., D. C.*), **Air conditioning the hospital.** *Air Conditioning, Heating and Ventilating*, N. Y., 54(1):74–86, Jan. **1957.** 7 figs. **DLC**—Map of U. S. shows isolines of average number of hours in a year when dry bulb temperature exceeds 85°F. Factors affecting design of hospital air conditioning systems are discussed on p. 84–5. These include air movement, humidity, ventilation, ultraviolet sterilization, etc. Reluctance to provide warm air heating systems in hospitals has been due to fear of airborne infection circulating from one part of the hospital to another. *Subject Heading:* **1. Hospital air conditioning.**—*M.R.*

8.10–279 551.586:551.589

Kiss, István, **A szinoptika felhasználása a biológiai kutatásokban.** [Use of synoptic meteorology in biological research.] *Időjárás*, Budapest, 60(4):236–241, July/Aug. **1956.** fig., 9 refs. Russian and French summaries p. 236. **DLC**—Literature containing examples of synoptic meteorology applied to the forecasting of desiccation of plants, weather sensitivity and bird migration, is reviewed. The author's observations of the mass production of plant microorganisms are reported (Nov. 1–8, 1950) and graphically compared with data on pressure, temperature, frontal passages, humidity, wind, precipitation and cloudiness. Mass production of plant microorganisms is found to be connected with prefrontal situations. *Subject Headings:* **1. Bioclimatology 2. Synoptic climatology.**—*G.T.*

UPPER AIR CLIMATOLOGY

See: **Wind statistics, Singapore** (Scott), 8.10–202.

ENVIRONMENTAL INFLUENCES

See: **Climatological bench-mark network** (Swartz), 8.10–272; **Microclimat. and regional planning** (Sauberer), 8.10–269.

SYNOPTIC CLIMATOLOGY

See also: **Synoptic climatology, Arctic** (Hare et al.), 8.10–27; **Ceiling and visibility, Hong Kong** (Baker, Hughes), 8.10–56; **Synoptic study of W. African squall lines** (Eldridge), 8.10–151; **Use of synoptic met. in biol. res.** (Kiss), 8.10–279.

8.10–280 551.589 551.509.318

U. S. Air Weather Service, **Atlantic-European weather types, 1899–1945: classification, calendar, uses and climatology.** Its *AWS Technical Report*, 105–137, Aug. **1955.** 40 p.

36 figs., table, tabulated calendar. **DWB** (M055 U58a)—An air mass classification scheme for the N. Atlantic and Europe based on KRICK's system developed at Caltech, and similar to BAUR's European types, is described and a digital calendar for each day from 1899–1945 (where charts are available) presented showing type assigned to the map for that day. Frequency distributions are shown in tables and in histogram form for each type each season, and typical surface and 750 mb charts presented for each type. Basically, the system depends on 3 main circulation features: 1) zonal flow with alternating cyclonic-anticyclonic activity, 2) meridional flow with a dominant blocking high over Central Europe and 3) meridional flow with dominant cyclonic activity over Western Europe. *Subject Headings:* **1. European weather types 2. Synoptic climatology 3. Forecast aids 4. Europe. I. Krick, I. P.**—*M.R.*

8.10–281 551.589.5:656.71(71)

Potter, J. G., **Diurnal and seasonal variation of low ceilings and visibilities at selected Canadian Stations.** *Canada. Meteorological Div., CIR*-2844, TEC-241, Nov. 26, **1956.** 8 p. 5 figs., ref. **DWB, DLC**—The Deutscher Wetterdienst (West German Weather Service) is planning to publish a series of aeronautical climatological studies. Some Canadian data have been summarized recently by Climatological Division for inclusion in this series. Due to the novel presentation of the variation of low ceilings and visibilities on a diurnal basis, these summaries for Goose, Gander, Sydney, Montreal, and Winnipeg should be of particular interest to the meteorologists directly concerned with hazardous flying conditions at these airports. The method of summarizing these data is described to illustrate how similar summaries may be compiled for other airports in Canada. *Subject Headings:* **1. Flying weather data 2. Ceiling and visibility data 3. Goose Bay, Labrador 4. Sydney, N. S. 5. Gander, Newfoundland 6. Montreal, Quebec 7. Winnipeg, Manitoba.**—*Author's abstract.*

MISCELLANEOUS

COSMIC INFLUENCES

See also: **Eclipse effects on E layer** (Harang, Pedersen), 8.10–16; **Solar flare effects on ionosphere** (Agy), 8.10–132; **Solar eclipse obs.** (Das), 8.10–288.

8.10–282 551.590.24:523.78

[Das, A. K.], **Report of the Indian expedition to Ceylon to observe the total solar eclipse of June 20, 1955.** *Indian Journal of Meteorology and Geophysics*, Delhi, 7(4):323–332, Oct. **1956.** 6 figs. **DWB, DLC**—The various items observed at Hingurakgoda during the solar eclipse and the general results obtained are described. Optical, ionospheric, geomagnetic and radio-astronomical observations were carried out. A map shows the zone of totality and the observing sites in Ceylon and Kodaikanal, diagrams and graphs show coronal activity on eclipse day and path of moon's center, F2 layer critical frequencies on eclipse day and mean control day, state of the sun's activity on the morning of the eclipse day as observed at Kodaikanal, etc. *Subject Headings:* **1. Solar eclipse, June 1955 2. Solar eclipse observations 3. Ceylon.**—*I.L.D.*

OPTICAL PHENOMENA

See also: **Calculating attenuation index** (Feigel'son, Pastukhov), 8.10–153; **Sodium lines in nightglow and twilight** (Omholt), 8.10–157; **Haze and cloud photography** (Ananthakrishnan), 8.10–231.

8.10–283 535.4:551.593.1

Penndorf, Rudolf (*Air Force Camb. Res. Center, Mass.*), **Tables of the refractive index for standard air and the Rayleigh scattering coefficient for the spectral region between 0.2 and 20.0μ and their application to atmospheric optics.** *Optical Society of America, Journal*, 47(2):176–182, Feb. **1957.** 6 tables, 8 refs., 21 eqs. **DWB, DLC**—The refractive index of standard air has been tabulated for the range 0.2 to 20.0μ, namely, 0.2(0.01)0.8; 0.8(0.1)2.0;

2.0(0.5)10.0; 10(1)20μ. The values are based on Edlén's formula. For computations of Rayleigh scattering, the scattering cross sections, the mass and volume scattering coefficients have been tabulated for the same values of wavelength as for the refractive index. The optical thickness and the transmissivity of the standard atmosphere is given next, and finally, the mean scattering coefficient for visual observations which is $\beta_v = 1.23 \times 10^{-7}$ (cm^{-1}). *Subject Headings:* **1. Refractive index 2. Rayleigh scattering 3. Atmospheric optics 4. Standard atmosphere.**—*Author's abstract.*

8.10–284 551.593.5

Sekera, Zdenek, **Scattering of light in the atmosphere and diffuse sky radiation.** *Science Progress*, London, 45(179):479–494, July **1957.** table, 27 refs. **DWB**—This general account of scattering begins with RAYLEIGH's classical theory of 1871, including color of the sky and polarization of skylight. CHANDRASEKHAR's solution of the theory of radiative transfer (1950) is set out. The theoretical results are applied to a molecular atmosphere and compared with measurements of skylight from the actual atmosphere, using a photoelectric polarimeter which permitted polarization measurements in several narrow spectral ranges from UV to infrared. Deviations of polarization from theory are due to monomolecular scattering in UV and to dust or haze particles in infrared. The theory of radiative transfer in a turbid atmosphere is set out and finally diffuse sky radiation during twilight discussed. *Subject Heading:* **1. Scattering of light.**—*C.E.P.B.*

8.10–285 551.593.51

Snow, G.; Barlow, E. W. and Cousins, P. S., **Green flash.** *Weather*, 12(6):199–200, June **1957.** **DWB**—Discussion of forms taken by green flash. It may occur as sun disappears or with part of disk above horizon. *Subject Heading:* **1. Green flash.**—*C.E.P.B.*

8.10–286 551.593.54:523.43

Hess, Seymour L., **Blue haze and the vertical structure of the Martian atmosphere.** Florida. State Univ., Tallahassee. Dept. of Meteorology, Contract Nonr-1600(00), Project NR-082-071, Technical Report No. 8, Feb. 1, **1957.** 12 p. 2 figs., 9 refs. **DWB**—The atmospheric haze which usually obscures the surface of Mars in blue light is probably a condensate rather than a dust because it can clear away rapidly. Carbon dioxide and water vapor are both present in the atmosphere, and condensation of each into the solid phase has been suggested to explain the blue haze. Calculations are carried out assuming a convective atmosphere with a surface temperature of +10°C for the sub-solar point and a lapse rate of 3.7°C per km. When the optical properties of clouds produced in such an atmosphere are determined with the aid of the Mie theory of scattering it is found that: 1) Carbon dioxide ice clouds are far too opaque to be the cause of the blue haze. 2) Water ice clouds can cause the blue haze only if the surface frost point lies near −90°C. The second result is consistent with the failure of all modern attempts to detect water vapor spectroscopically in the Martian atmosphere, since the total precipitable water content corresponding to such a frost point is only 2 microns. *Subject Headings:* **1. Blue haze 2. Martian atmosphere 3. Mie scattering.** —*Author's abstract.*

8.10–287 551.593.55

Kent, R. D. (*Central Off., Melbourne*), **Twilight phenomena.** *Australian Meteorological Magazine*, Melbourne, No. 14:56–57, Sept. **1956.** 2 figs., 2 refs. **DWB**—A sketch shows details of a purple anti-crepuscular phenomenon observed at Springvale, Melbourne on Nov. 10, 1955 at 7 p.m. Several narrow blue-gray rays followed by a brilliant band of violet lights radiated from a solitary glowing cloud opposite the setting sun, (ENE). NEUBERGER (1951) gave a model and explanation which is reproduced. *Subject Headings:* **1. Anti-crepuscular rays 2. Twilight phenomena 3. Melbourne, Victoria.**—*M.R.*

8.10–288 551.593.9

Shu, En Khan, **Kazhushchaiasia spliusnutost' nebesnogo svoda i izmenenie kazhushcheĭsia velichiny diska solntsa i luny.** [Apparent flattening of the firmament and change in

the apparent enlargement of the disk of the sun and moon.] *Acta Meteorologica Sinica*, Peking, 26(1/2):144–148, **1955.** 7 refs., 20 eqs. In Chinese; Russian summary p. 148. **DLC**—The apparent enlargement of the disk of the sun and moon when near the horizon is said to be closely connected with the seeming flattening of the "dome" of the sky. Rather than assuming the sky to be a part of a sphere, the author assumes it to be a half of an elliptical spheroid and then determines the angular dimensions of a disk projected on this dome. Results are compared with observed results and are said to conform. Detailed tables and nomograms are presented to show calculations. *Subject Headings:* **1. Enlargement of sun and moon near horizon 2. Shape of sky.**—*From author's abstract, M.R.*

ELECTRICAL PHENOMENA

See also: **Radioactive snow gages** (Higashi, Itagaki), 8.10–103; **Charges nuclei** (Siksna), 8.10–215.

8.10–289 551.594.12:551.558.29

Byers, H. R., **Charged nuclei and subsidence.** *Royal Meteorological Society, Quarterly Journal*, 83(357):387–388, July **1957.** 4 eqs. **DWB**—Referring to R. C. Sagalyn and G. A. Faucher (*R. Meteor. Soc., Q. J.*, 82:428–455, **1956**; *see* 8.2–311, Feb. 1957, *MAB*), in Fig. 5 their measurements of decrease of total nuclei are compared with theoretical rate. In one of the situations (May 13–14, 1954) subsidence was pronounced, and effects of this are calculated. Subsidence comes out as 240 ft/hr at 3000 ft, and though flight was in center of an anticyclone, this seems too high. *Subject Heading:* **1. Nuclei height variations.**—*C.E.P.B.*

8.10–290 551.594.13:551.510.535

Maeda, Hiroshi (*Geophysical Inst., Kyoto Univ.*), **Daily variations of the electrical conductivity of the upper atmosphere as deduced from the daily variations of geomagnetism. Pt. 2, Non-equatorial regions.** *Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere Research in Japan*, 10(2):49–68, **1956.** 18 figs., 4 tables, 17 refs., 25 eqs. **DWB**—The results of previous studies (1, 2, 3) on the daily variations of the electrical conductivity of the upper atmosphere in regions except the equatorial zone are interpreted from the point of view of the anisotropy of ionospheric conductivity, and as a summary of the works made in Pts. I and II, a formula for the world distribution of ionospheric conductivity is proposed. An abnormal feature of the daily variation of conductivity in the auroral zone, as first pointed out by M. Hasegawa (1), is also examined, and it is found that this phenomenon is related to the auroral E layer which appears during magnetic disturbances and aurorae. (For Pt. 1, *see* 8.6–354, June 1957, *MAB*.) *Subject Headings:* **1. Diurnal electrical conductivity variations 2. Ionospheric conductivity.**—*Author's abstract.*

8.10–291 551.594.14:551.508.91

Steinhauser, F., **Vorläufige Mitteilungen über Freiluft-Registrierungen mit dem Geiger-Zähler.** [Preliminary report on free air recordings with the Geiger counter.] *Akademie der Wissenschaften. Vienna, Math.-Naturwiss. Klasse, Anzeiger*, No. 11:209–215, **1955.** 2 figs. abstracted from reprint.—In order to be prepared for the dangerous variations of radioactivity in the air now possible in view of repeated explosions of A bombs and the expansion of installations for the peaceful use of atomic energy, a new method of measuring these variations in the lowest air layer by direct recording with a Geiger counter has been developed. The method and apparatus developed in the Austrian "Zentralanstalt" for Meteorology and Geodynamics, and the first results of the recordings made in Aug. 1955, are presented and discussed. *Subject Headings:* **1. Radioactivity in the atmosphere 2. Geiger counters.**—*A.M.P.*

8.10–292 551.594.21:621.396.8

Large, M. I., **The radio interference produced by corona discharge.** *Journal of Atmospheric and Terrestrial Physics*, 10(5/6):245–250, **1957.** 3 figs., 9 refs., 10 eqs. **DWB**—In thundery weather many conducting points, such as trees and radio aerials, discharge electricity into the air by corona mechanism, causing radio interference ("rain static"). This was

investigated by a point-to-plane gap. Band spectra were observed with the negative-point corona, becoming uniform beyond about the 10th harmonic. Theory is discussed. Radio interference is also observed with corona from power lines. *Subject Headings:* **1. Radio noise 2. Thunderstorm electricity.**—*C.E.P.B.*

8.10–293 551.594.221:537.52

Bruce, C. E. R. (*E.R.A. Labs., Middlesex, Eng.*), **The leader stroke of the lightning discharge.** *Journal of Scientific and Industrial Research, Sec. B*, New Delhi, 14(9):480, Sept. 1955. 6 refs. **DLC, DWB**—A discrepancy by a factor of the order of a hundred exists between theory and observations of leader strokes. Recent papers and discussions are outlined in this note, dealing with a paper published by Srivastava and Khastgir (*Ibid.*, Sec. B, 14:34, 1955; *see* 7.7–267, July 1955, *MAB*). *Subject Heading:* **1. Lightning theory.**—*A.A.*

8.10–294 551.594.221

Bruce, F. M., **High-voltage spark discharges.** *Endeavour*, London, 13(50):61–71, April 1954. 20 figs., 21 refs. **DLC**—Illustrated article on nature of lightning and similar laboratory spark discharges, accompanying fields and mechanisms. *Subject Heading:* **1. Lightning.**—*M.R.*

8.10–295 551.594.222:551.594.11:551.556

Kirkman, J. R. and Chalmers, J. Alan, **Point discharge from an isolated point.** *Journal of Atmospheric and Terrestrial Physics*, 10(5/6):258–265, 1957. 5 figs., 14 refs., 9 eqs. **DWB**—The point-discharge current I from an isolated point at 27-m and 34-m height was measured and related to the wind-speed W and the potential gradient F at the ground at 47 m to windward, and also to the output of an agrimeter 7 m below the point. The results were related by $I=K(W+c)(F-M)$, and it is shown that a formula of a similar type also fits earlier results which had previously been thought to obey a square law for I against F. *Subject Headings:* **1. Point discharge 2. Potential gradient 3. Wind effects on point discharges.**—*Authors' abstract.*

8.10–296 551.594.222:551.556

Large, M. I. and Pierce, E. T., **The dependence of point-discharge currents on wind as examined by a new experimental approach.** *Journal of Atmospheric and Terrestrial Physics*, 10(5/6):251–257, 1957. 2 figs., 13 refs., 10 eqs. **DWB**—Experiments are described in which a metal point mounted in the open air is artificially raised to a high potential V and the resulting point-discharge current I is measured. The relation $I=A(V-V_o)(W^2+c^2V^2)^{\frac{1}{2}}$, where A and c are constants, W the wind speed, and V_o the onset potential, is found to fit the results reasonably well. It is shown that all point-discharge experiments may be interpreted in terms of the rapidity with which the ambient space-charge is removed; this removal may be by the wind or by the ion velocity in the surrounding field, and the relative importance of the two factors will vary from experiment to experiment. Finally, some remarks on the alti-electrograph results are appended. *Subject Headings:* **1. Point discharges 2. Wind effects on point discharges.**—*Authors' abstract.*

AURORAS

See also: **Auroral luminescence, Tromsö** (Vegard), 8.10–24; **Auroral enhancement of infrared radiation** (Murcray), 8.10–159.

8.10–297 551.594.5:621.396

Hartz, T. R.; Reid, G. C. and Vogan, E. L. (*all, Radio Physics Lab., Def. Res. Board, Shirley Bay, Ottawa, Ont.*), **V.H.F. auroral noise.** *Canadian Journal of Physics*, Ottawa, 34(7):728–729, July 1956. fig., 6 refs. **DWB, DLC**—Forsyth, Petrie and Currie reported in 1949 noting radio frequency radiation from the aurora, though later studies failed to support such occurrence. The present report shows radio frequency (32Mc) emissions at the time of an aurora on March 21–22, 1956. The fact that it was also noted on 50 and 53Ms/s rules out the possibility that it was from a distant station. The signals might, however, originate from the disturbed ionosphere at the time of an aurora. On numerous other occasions similar signals

or noise has been recorded at the Radio Physics Lab., Ottawa, at the time an aurora was observed visually and recorded on a magnetometer, and a photomultiplier directed at the northern sky. *Subject Headings:* **1. Radio frequency radiation from auroras 2. Ottawa, Ontario.**—*M.R.*

8.10–298 551.594.5(09)

Matsushita, S. (*High-Altitude Obs., Univ. of Colorado*), **Ancient aurorae seen in Japan.** *Journal of Geophysical Research*, Wash., D. C., 61(2, Pt. 1):297–302, June 1956. 3 figs.,table. **DLC**—A critical analysis and tabulation of data on auroras observed in Japan from 620 AD to 1909 (taken from Nippon Kisho-Shiryo, **Historical Data on Meteorology in Japan, 1939 and 1943**). Many of these reports may have been reports of zodiacal light or twilight phenomena, so each report is evaluated according to author's estimate of reliability. The reports are then correlated graphically with sunspot periods and with auroras in other parts of the world. Seasonal distribution of all reports and of "probable" auroras show usual bimodal distribution with maximum in Feb.–March and in Sept. and minimum in Dec.–Jan. and Jun.–Aug. *Subject Headings:* **1. Auroral catalogs 2. Historic auroras 3. Japan.**—*M.R.*

8.10–299 551.594.51:535.33

Bagariatskiĭ, B. A. and Fedorova, N. I. (*Geophys. Inst., Acad. Sci. U.S.S.R.*), **Spektr poliarnykh siianiĭ v oblasti 9000–10500 Å.** [Auroral spectrum in the region 9000–10500 Å.] *Akademiia Nauk SSSR, Doklady*, 103(6):1009–1011, Aug. 21, 1955. fig., 2 tables, 10 refs. **DLC.** Translation by E. R. Hope issued as *Canada. Defence Research Board, T 221 R*, June 1955. 3 p. fig., 2 tables, 10 refs. **DWB**—The author summarizes briefly earlier studies on the spectra in the region of longer wave lengths (7000 Å and above) and then analyzes spectra in the region 9000–10500 Å. Hydroxyl and N_2 bands were identified. *Subject Headings:* **1. Auroral spectra 2. Auroral nitrogen bands. I. Hope, E. R.** (*trans.*).—*I.L.D.*

8.10–300 551.594.51:551.521.9

Bates, D. R., **Note on the processes governing emission by incident heavy particles.** (In: **The airglow and the aurorae: a symposium.** London, Pergamon, 1956. p. 251–253. 8 refs., 21 eqs.) **DWB**—The processes which determine the intensity of the emission from any hydrogen, helium, and sodium in the primary auroral stream are briefly discussed. *Subject Headings:* **1. Auroral emissions 2. Auroral hydrogen lines 3. Auroral helium lines.**—*Author's abstract.*

8.10–301 551.594.51:535.33

Omholt, A., **The red and near-infra-red auroral spectrum.** *Journal of Atmospheric and Terrestrial Physics*, 10(5/6):320–331, 1957. 3 figs., 3 tables, 27 refs., 4 eqs. **DWB**—Six auroral spectra covering the wave length range 5400–8800 Å have been subject to thorough intensity measurements. The intensity distributions in the First Positive band system and the Meinel band systems were measured and related to theoretical data. The altitude variations of these band systems and the strongest oxygen lines and bands were studied, the intensity ratio between the red [O I] lines λ6300/64 and the First Positive bands being taken as an indication of relative altitude. An auroral feature detected at 7325 Å on spectra from high altitudes is tentatively identified as the [O II] multiplet $^2D - ^2P$. The intensity distribution and its variation with altitude are briefly discussed. *Subject Heading:* **1. Auroral spectra.**—*Author's abstract.*

RADIO METEOROLOGY

See also: Special bibliography on **Tropospheric Propagation,** p. 1374.

8.10–302 551.594.7:551.594.5

Ellis, G. R., **Low-frequency radio emission from aurorae.** *Journal of Atmospheric and Terrestrial Physics*, 10(5/6):302–306, 1957. 2 figs., table, 11 refs., 2 eqs. **DWB**—This paper discusses the possibility that Čerenkov radio emission by auroral particles approaching the earth may contribute to the level of the continuous component of atmospheric radio noise

observed at frequencies of hundreds of kilocycles per second. It is shown that, provided the Čerenkov process is valid at radio frequencies, the flux density of the radiation may be as high as 10^{-21} $Wm^{-2}(c/s)^{-1}$ at these frequencies, well above the minimum observable using current techniques. The frequency range of the emission would extend from a few hundred kc/s to low-audio frequencies. *Subject Heading:* **1. Radio emission from auroras.**—*Author's abstract.*

8.10–303 551.594.7

Landmark, B., **The fading of radio waves reflected from the *E* layer.** *Journal of Atmospheric and Terrestrial Physics*, 10(5/6):288–295, **1957.** 10 figs., 7 refs., 5 eqs. **DWB**—The amplitude and phase of waves of frequency 2 Mc/s reflected vertically from the E layer were studied. It was found that there were regions in the wave pattern, of extent D, at the centre of which the phase-path exceeded that at the edges by ΔP. When $\Delta P/D < 0.025$ approximately, the variations of amplitude and phase were associated as they would be if the phase variation was caused by a concavity in the reflecting layer. There resulted a "burst" of amplitude caused by focusing, inside which there was comparatively rapid fading. When $\Delta P/D > 0.025$, the conditions became more complicated, but on one occasion could still be analysed in terms of a moving concavity in the layer. Observations made at night on waves of frequency 200 kc/s reflected at an angle of incidence of about 40° were explicable in terms of the same model. *Subject Heading:* **1. Radio fading patterns.**—*Author's abstract.*

PART II. ANNOTATED BIBLIOGRAPHY ON PROPAGATION OF UHF, VHF, AND SHF RADIO WAVES THROUGH THE TROPOSPHERE (1953–1957)

By: *Wilhelm Nupen*

INTRODUCTION

This is the second and concluding part of a bibliography on tropospheric propagation. The first part covering the literature up to and including 1952 was published in the September 1957 issue of *Meteorological Abstracts and Bibliography*. This second part covers the period 1953–1957. The subjects included are anomalous radio propagation in the UHF, VHF and SHF ranges, radio refractive index and its measurement, refractometers, and the climatology and meteorology of the various refractive index parameters from the micrometeorological layer up to the tropopause. For further details concerning the scope of the bibliographies and the subjects covered or omitted the reader is referred to the introduction to the September bibliography. The subject and geographical outlines presented below will help locate the items dealing with whatever general or detailed subjects might be of interest to the individual user. An attempt is made to increase the usefulness of the subject outline by adding in a number of instances (in parentheses) item numbers referring to the first part of the bibliography (8I–, September 1957). This bibliography, as the previous one, was prepared with the assistance of the National Bureau of Standards Boulder Laboratories.

OUTLINE OF CONTENTS

SUBJECT OUTLINE

Meteorological Aspects

Theoretical research
- History, 8J–3, –123 (8I–1, –13, –48, –71, –97, –99, –108, –132, –139)
- Theories (*see also* outline to September bibliography)
- Radio wave propagation, 8J–3
- Normal mode propagation, 8J–142
- Tropospheric scatter propagation, 8J–41, –82, –100, –103, –109, –133, –158, –164, –176, –179
- Booker-Gordon scattering theory, 8J–19, –29, –69, –102, –114
- Scattering due to turbulence, 8J–26, –99, –107, –117 to –119, –144, –145, –168, –172
- Stratospheric scattering, 8J–157
- Diffraction, 8J–69
- Fresnel-Kirchhoff diffraction theory, 8J–93, –94
- Bremmer-van der Pol diffraction theory, 8J–102
- Refraction, 8J–55, –131
- Reflection, 8J–60
- Reflection from stratified inhomogeneities, 8J–120, –149
- Method of inverse Laplace transform, 8J–162
- Ray theory, 8J–17, –98
- Stochastic theory, 8J–48, –49
- Field strength near line of sight, 8J–38, –104, –126
- Propagation over nonhomogeneous terrain, 8J–44, –80
- Oceanic duct propagation, 8J–5
- Wide-angle radiation, 8J–74

General type of work
- Statistical studies, 8J–15, –47, –48, –67, –81, –83, –84, –87, –102, –136, –148, –154, –156, –160, –165, –173, –177, –185 (8I–21, –67, –77, –81, –109, –129, –143, –148)
- Research and Progress reports, 8J–12, –13, –14, –17, –23, –24, –32, –33, –36, –54, –56, –59, –60, –61, –62, –64, –66, –72, –87, –97, –111, –118, –132, –150, –151, –154, –156, –169, –170, –171, –177, –178, –183, –184, –190 (*see also* outline to September bibliography)
- Textbooks and manuals, 8J–3, –13, –36, –133 (8I–1, –71, –119, –139)
- Conferences, Symposiums, etc., 8J–11, –25, –37, –91, –142, –166, –187 (8I–5, –24, –27, –31, –102)
- Bibliographies, Literature reviews, etc., 8J–21, –56, –88, –96, –100, –111, –141, –143, –169, –170, –171, –185 (8I–4, –71, –107, –116, –139)

Tropospheric structure, 8J–3, –11, –45, –46, –49, –99, –115, –127, –139, –140, –153, –154, –157, –181 (8I–9 to –13, –46, –47, –50, –51, –56, –59, –77)
Altitudes
up to 1 km, 8J–24, –67, –108, –119 (8I–142)
up to 2 km, 8J–58, –66 (8I–62, –84, –141)
up to 3 km, 8J–47 (8I–130)
up to 6 km, 8J–14, –15, –20 (8I–38)
up to 8 km, 8J–22, –33, –62
up to 12 km, 8J–169 (8I–9, –12, –13, –64)
up to 20 km, 8J–132, –146
Temperature distribution, 8J–144, –147, –157, –189 (*see also* outline to September bibliography)
Moisture distribution, 8J–52, –144, –148, –153, –155 (*see also* outline to September bibliography)
Pressure distribution (8I–94 to –96, –130)
Inversions (*see* outline to September bibliography)
Inversion frequency, 8J–12, –116
Temperature inversions, 8J–1, –2, –31, –36, –39, –51, –60, –92, –108, –132, –135, –163, –167 (8I–22, –24, –35, –62, –141, –142, –146)
Humidity lapses, 8J–2, –9, –36, –51, –76, –108 (8I–24, –35)
Shadow zones (8I–46)
Atmospheric refractive index (*see* outline to September bibliography)
Standard refractive index, 8J–2, –4, –6, –8, –12, –47, –49, –51, –72, –79, –86, –102, –110, –122, –125, –127, –131, –132, –137 (8I–33)
Modified refractive index, 8J–43, –116 (8I–20, –33, –40, –57, –89, –101, –120)
Forecasting, 8J–12, –165, –173, –185, –189 (8I–20)
Computation, 8J–23, –27, –31, –33, –34, –35, –40, –52, –122, –160, –182 (*see also* outline to September bibliography)
Variations, 8J–15, –25, –35, –98, –127, –141, –144, –146, –164 (*see also* outline to September bibliography)
Profiles, 8J–14, –72, –138, –152, –154, –155 (8I–40, –109, –122)
Refractive index measurements (*see* outline to September bibliography)
from 0 to 50 ft, 8J–122 (8I–82, –135)
from 50 to 350 ft, 8J–67, –68, –108 (*see also* outline to September bibliography)
up to 2,000 ft, 8J–24, –60, –66 (8I–121)
up to 10,000 ft (8I–122)
up to 12,000 ft, 8J–14, –15
up to 30,000 ft, 8J–47, –72, –77, –169
up to 100,000 ft, 8J–169
Ducts, 8J–7, –45, –46, –124 (*see also* outline to September bibliography)
Ground ducts, 8J–20 (8I–77, –89, –121)
Oceanic ducts, 8J–5, –59, –108, –122 (*see also* outline to September bibliography)
Formation of ducts, 8J–17, –92, –113, –148 (8I–43, –65, –120, –121, –127)
Forecasting radio-weather conditions, 8J–4, –5, –20, –42, –69, –83, –95, –97, –124, –148, –153, –154, –156, –160, –161, –165, –166, –189 (*see also* outline to September bibliography)
Scattering agents (discontinuities, "blobs," etc.), 8J–29, –73, –139, –140, –144, –145, –149
Fronts, 8J–51 (8I–10, –32, –34, –45, –87, –143)
Air masses, 8J–7, –22, –72, –92 (8I–34, –38, –63)
Wind, 8J–5, –57, –58, –107, –168 (8I–14, –72, –92, –143, –145)
Cyclones (8I–14, –145)
Anticyclones, 8J–9, –167 (8I–14, –145)
Föhn (8I–72, –92, –143)
Thunderstorms (8I–8, –26, –63)
Turbulence, 8J–26, –38, –46, –58, –86, –98, –99, –107, –109, –114, –115, –117, –119, –145, –163, –168, –172 (*see also* outline to September bibliography)
Precipitation particles (8I–3, –42, –58, –123)
Graupel (8I–3)
Waterdrops, 8J–27 (8I–15, –42, –123)
Rain, 8J–98 (8I–3, –81, –93)
Snow, 8J–147 (8I–3)
Clouds, 8J–125 (8I–15, –63, –123)
Fog, –188 (8I–15, –45)
Water vapor (8I–63, –81, –95, –101)
Meteors (8I–111)
Refraction, 8J–37, –181, –182, –185, –189 (*see also* outline to September bibliography)
Superrefraction, 8J–8, –12, –43, –51, –53, –73, –76, –113, –124, –129, –149, –188 (*see also* outline to September bibliography)
Subrefraction, 8J–159
Reflection (*see* outline to September bibliography)
"Angels," 8J–9, –141 (8I–55, –59)
Angle of arrival, 8J–98, –154 (8I–23, –49, –136)
Molecular absorption (8I–42, –67)
Water vapor, 8J–59, –61, –153, –178 (8I–42)
Oxygen, 8J–59, –61, –153, –178 (8I–42)

Radio Technical Aspects

Laboratory experiments (8I–40, –135)
Transmission experiments, 8J–18, –74, –97, –105, –108, –112, –114, –128, –129, –134, –139, –148, –167, –183 (*see also* outline to September bibliography)
Point-to-point, 8J–19, –30, –41, –43, –58, –61, –69, –78, –96, –128, –167, –180 (*see also* outline to September bibliography)
Air-to-air (8I–83, –109, –134)
Air-to-ground, 8J–47 (8I–52, –74, –83, –109, –134)
Air-to-sea, 8J–47
Ground-to-air (8I–11)
Land-to-sea (8I–6, –28, –57, –81, –92)
Transmission paths (*see outline* to September bibliography)
Arctic paths (8I–8)
Desert paths (8I–39, –70)

Mountain paths, 8J–4, –19, –58, –65, –66, –78, –89, –93, –94, –183, –184 (8I–3, –17, –32, –96, –148)
Overland paths, 8J–30, –41, –55, –102, –167 (8I–7, –39, –67, –73, –76, –91, –129)
Over land-sea paths, 8J–30, –47, –70, –75 (8I–6, –57, –81, –92)
Over sea paths, 8J–1, –5, –30, –47, –55, –63, –70, –75, –80, –84, –108, –129, –159, –160, –167, –175, –189 (*see also* outline to September bibliography)
Over smooth terrain (8I–43, –67, –91)
Over rough terrain, 8J–19, –44, –80, –85, –94, –95, –102, –134 (8I–51, –105, –115, –148)
Optical paths, 8J–17, –38, –43, –85, –86, –89, –90, –98, –101 (*see also* outline to September bibliography)
Non-optical paths, 8J–7, –10, –16, –29, –45, –46, –53, –55, –58, –60, –65, –69, –70, –71, –73, –75, –86, –89, –90, –94, –95, –101, –108, –112, –114, –115, –117, –118, –121, –123, –128, –132, –133, –134, –146, –148, –177, –178, –179 (*see also* outline to September bibliography)
Diffraction (*see* outline to September bibliography)
Dielectric influences, –181 (8I–6, –17, –59, –63, –87, –98, –111, –137)
Obstacles (8I–8, –109)
Mountain, 8J–16
Terrain, 8J–18, –37, –44, –50 (8I–6, –43, –44, –80, –105, –117, –127)
Signal strength, 8J–4, –5, –7, –10, –22, –30, –38, –55, –57, –59, –60, –63, –64, –67, –81, –83, –84, –89, –90, –93, –94, –95, –104, –105, –110, –114, –119, –121, –126, –132, –139, –140, –146, –148, –152, –163, –164, –173, –177, –178, –179, –183, –184 (*see also* outline to September bibliography)
Ground waves, 8J–64, –162
Fading, 8J–16, –39, –41, –42, –43, –81, –82, –84, –89, –90, –93, –101, –112, –114, –189 (*see also* outline to September bibliography)
Fast fading, 8J–101 (8I–12, –76, –148)
Slow fading, 8J–101 (8I–76)
Diurnal and seasonal variations, 8J–4, –7, –60, –65, –66, –105 (8I–36, –91, –115, –124, –125
Shadow losses, 8J–18, –90, –93, –94, –102 (8I–73, –79, –80)
Radio holes, 8J–13
Wave bands
FM, 8J–57, –58 (8I–32, –43, –85, –148)
L-Band, 8J–1 (8I–51 to –53, –77)
S-Band (8I–51 to –53, –77)
X-Band (8I–51 to –53, –77)
Wave lengths (frequencies)
(1–30 Mc), 8J–64
Meter waves (30 to 300 Mc), 8J–8, –22, –34, –41, –55, –57, –58, –67, –76, –85, –86, –89, –90, –92, –93, –112, –121, –129, –137, –148, –152, –153, –163, –167, –175 (*see also* outline to September bibliography)
Decimeter waves (300 to 3,000 Mc), 8J–18, –34, –43, –85, –89, –93, –95, –108, –128, –132, –147, –153 (8I–5, –63, –91, –117, –131)
Centimeter waves (3,000 to 30,000 Mc), 8J–5, –9, –20, –32, –34, –94, –95, –112, –114, –122, –129, –147, –153, –188 (*see also* outline to September bibliography)
Millimeter waves (30,000 and up), 8J–59, –61, –153, –178 (8I–42, –106, –137)
VSW (VHF), 8J–7, –42, –45, –53, –63, –73, –83, –87, –99, –117, –118, –119, –134, –135, –139, –140 (8I–5, –12, –23, –40, –86)
USW (UHF), 8J–7, –70, –75, –81, –115, –118, –189 (8I–6, –62, –67, –123, –130, –131)
Wave length selection, 8J–105, –134 (8I–28, –36, –43)
Wave velocities, 8J–79 (8I–9, –64, –74, –97, –118, –128)
Instrumentation and devices (*see* outline to September bibliography)
Antennas, 8J–28, –31, –41, –65, –69, –70, –71, –74, –75, –81, –82, –85, –90, –93, –98, –102, –109, –114, –121, –133, –143 ,–163, –175, –179 (8I–23, –43, –80, –115)
Radiosondes, 8J–1
Radar, 8J–1, –5, –9, –63, –113, –131, –159, –188 (*see also* outline to September bibliography)
Refractometers, 8J–14, –15, –47, –68, –77, –125, –127, –165, –169, –173, –186, –190 (8I–82, –103)
Computers, 8J–23, –130
Sounding system, 8J–24
Slide rules, 8J–40
Magnetron transmitters, 8J–61
Crystal video receivers, 8J–61
(For additional instrumentation, *see* outline to September bibliography)
Methods of observation, 8J–8 (*see also* outline to September bibliography)
Networks, 8J–113, –116, –134 (8I–41, –88, –121)
Soundings, 8J–1, –14, –24, –67, –72, –76, –108, –110, –125, –138, –141, –146, –154 (*see also* outline to September bibliography)
Towers, 8J–62, –66, –68, –183 (8I–84, –105)
Observatories (8I–3, –62)
Flights, 8J–15, –47, –52, –62, –63, –77, –125, –127, –132, –146, –163, –169
Graphical methods, 8J–13, –14, –34, –81, –132 (8I–16, –25, –27, –43, –64, –101)
Synoptical methods, 8J–7, –58, –110, –113, –116, –138, –148, –153, –155
Radars, 8J–13, –20, –35, –63, –113, –136, –141
Ship observations, 8J–160, –175
Radio communication maps
Ground conductivity maps, 8J–50, –54
Humidity maps, 8J–153, –155
Ground refractivity maps, 8J–156
Air-sea refractivity maps, 8J–160
Signal field maps, 8J–161

GEOGRAPHICAL OUTLINE

North America
Alaska, 8J–154
Aleutians, 8J–138
Canada, 8J–52, –138
Lake Ontario, 8J–20
Newfoundland, 8J–7
Scarboro, Ontario, 8J–20
United States
Arizona
Fort Huachuca, 8J–190
Tucson, 8J–125
Yuma, 8J–125
California
San Diego, 8J–37, –129
San Pedro, 8J–129
Colorado, 8J–4, –15, –127
Boulder, 8J–170
Cheyenne Mountain, 8J–19, –65, –66, –78, –89, –183, –184
Denver, 8J–66, –125
Haswell, 8J–66
Pikes Peak, 8J–93
District of Columbia
Washington, 8J–57, –134
Florida, 8J–127
Key West, 8J–30
Miami, 8J–30, –155
Illinois, 8J–152
Lake Michigan, 8J–33
Rantoul, 8J–125
Kansas
Dodge City, 8J–66
Maryland
Baltimore, 8J–134
Massachusetts
Boston, 8J–105
Ft. Banks, 8J–125
Round Hill, 8J–139, –141
Michigan
Mt. Clements, 8J–125
Missouri
Lamar, 8J–128
New York
Ithaca, 8J–95
Long Island, 8J–68
Wethersfield-Springs, 8J–95
Northern States, 8J–76
Ohio, 8J–14, –47
Pacific Coast, 8J–14
Pennsylvania
Pittsburgh, 8J–58
Rocky Mountains, 8J–41
Texas
Austin, 8J–11, –22, –61
Dallas, 8J–22
San Antonio, 8J–22
Virginia
Richmond, 8J–57
Sterling, 8J–139
Europe
Belgium
Uccle, 8J–167
Germany
Kühlungsborn, 8J–55
Great Britain
England, 8J–167
Cambridge, 8J–9
Scotland, 8J–167
Shetland Islands, 8J–167
Wales
Cardigan Bay, 8J–5
Netherlands
Scheveningen, 8J–167
Norwegian Sea, 8J–167
Africa
South Africa
Durban, 8J–108
Asia
Bay of Bengal, 8J–160
India
Dum Dum Airport, Calcutta, 8J–188
Japan
Hiraiso, 8J–60, –148
Izumi, 8J–94
Kanto District, 8J–113
Kawaguchi, 8J–94
Kokubunjii, 8J–60
Mt. Yamizo, 8J–94
Ryozen, 8J–94
Tokyo, 8J–64
Persian Gulf, 8J–160
South China Sea, 8J–160
Australia, 8J–51, –189
Oceans, Seas and Islands
Atlantic Ocean, 8J–116
North Atlantic, 8J–63, –105
Mediterranean Sea, 8J–160
Pacific Ocean, 8J–116, –132
Truk, 8J–154

1953

8J–1 551.594.7:621.396

Abnormal radar propagation [in] North Atlantic Ocean. *Marine Observer*, 23(161):147–148, July **1953.** DWB—July 24, 1952, O.W.S., 58°58′N., 19°15′W., land echoes observed on long pulse radar, indicated at 92–100 mi. Due to second trace echoes from Iceland, 260 mi distant. Radiosonde showed a temperature inversion at 986 mb. (*Same item as* 4.11–285, Nov. 1953, *MAB.*) *Subject Heading:* **1. Radar meteorology.**—*C.E.P.B.*

8J–2 551.594.7:621.396

Aden, Arthur L., **Feasibility of detecting atmospheric inversions by electromagnetic probing.** *U. S. Air Force. Cambridge Research Center, Air Force Surveys in Geophysics*, No. 34, March **1953.**

9 p. 7 refs., 19 eqs. **DWB**—An outline is given of the theory of standard and nonstandard propagation characteristics of electromagnetic waves, dependent on discontinuity of the refractive index. Vertical incidence atmospheric probing with standard L-band radar equipment should not give reflections from temperature and humidity inversions. There is only a remote possibility that proper equipment could be developed. (*Same item as* 6G–102, July 1955, *MAB.*) *Subject Headings:* **1. Tropospheric propagation 2. Refractive index 3. Inversions.**—*A.A.*

8J–3 551.510.535:621.396(02)

*†Al'pert, IA. L.; Ginzburg, V. L. and Feĭnberg, E. L., **Rasprostranenie radiovoln.** [Radiowave propagation.] Moscow, Gos. Izdat. Tekhniko-Teoreticheskoĭ Literatury, **1953.** 883 p. 128 figs., 124 tables, 373 refs. **DLC.** Translations of several chapters into English available Special Libraries Association, Translation Center (John Crerar Library, Chicago) as its R-1929 to R-1937.—The most advanced text on theoretical and empirical aspects of radio wave propagation in all bands from microwaves to long waves, and in the troposphere and ionosphere. First there is a historical sketch of progress in radio science since Popov (1845), especially in Russia. Then in Pt. I, the general theory of radio propagation; Pt. II, theory of propagation in ionosphere (p. 278–546); Pt. III, structure of ionosphere and experimental data on formation; regular and irregular processes in ionosphere (p. 547–680); Pt. IV, experimental investigations on propagation and comparison with calculated data by various methods (p. 681–870). The first part of this voluminous text is mainly theory; the last part is practical data, tables, recorder records and interpretations, nomograms, etc. All of the layers of the ionosphere are treated, as well as the troposphere, in relation to long distance propagation. Radar and impulse propagation are also considered. The extensive bibliography in 5 charts consists of about half Russian and half foreign literature through 1952. (*See also* 6D–149, April 1955, *MAB.*) *Subject Headings:* **1. Radio wave propagation 2. Ionospheric radio wave propagation 3. Tropospheric propagation 4. Bibliography on ionosphere 5. Textbooks.**—*M.R.*

8J–4 551.594.7:621.396

Anderson, L. J. and Gossard, E. E., **Prediction of the nocturnal duct and its effect of UHF.** *Institute of Radio Engineers, N. Y., Proceedings,* 41(1):135–139, Jan. **1953.** 6 figs., 4 refs. 7 eqs. **DLC**—A method is described for predicting diurnal variation in UHF field strengths, which is based on the micrometeorology governing the night-time refractive-index profiles. Using surface meteorological data from past years, predictions are made of the probability distribution of the diurnal field variations to be expected on 100 and 1000 mc over CRPL links in Colorado. The predictions are compared with field-strength observations taken in 1952, and the agreement is encouraging. *Subject Headings:* **1. Radio transmission ducts 2. Diurnal field strength variation.**—*Authors' abstract.*

8J–5 551.594.7:621.396

Anderson, L. J. and Gossard, E. E., **The effect of the oceanic duct on microwave propagation.** *American Geophysical Union, Transactions,* 34(5):695–700, Oct. **1953.** 7 figs., 8 refs., 3 eqs. Also similar title in: *Nature,* London, 172(4372):298–300, Aug. 15, **1953.** 4 figs., 4 refs., eqs. **DLC**—A body of experimental radio and meteorological data taken over Cardigan Bay, on the British west coast, is examined to ascertain how radar propagation is affected by the microwave duct lying next to the sea surface. The boundary-layer meteorological profiles are analyzed in terms of semi-empirical relation due to E. L. Deacon, and propagation is predicted according to a method of S. A. Schelkunoff. At three-cm wavelengths, it is found that the agreement between observation and theory becomes steadily better as wind speed increases, until at speeds above 15 mi/hr (7 m/s) the consistency is truly striking. At lower wind speeds there is a definite tendency to follow the theoretical pattern, but a great deal of scatter is noted. Possible explanations for this scatter are offered. More scatter is observed at nine cm than at three cm, and the transition to trapping conditions is less definite. The nine-cm waves appear to "feel" the effects of the duct some time before trapping occurs. An interpretation is offered of the fact noted by McPetrie and Starnecki that, in general, high signals are associated with large positive air-sea temperature differences, while low signals are accompanied by large negative differences. Also, Jones' observation that under unstable conditions high winds are accompanied by high signals is nicely explained. (For item in *Nature, see* 5.6–283, June 1954, *MAB.*) *Subject Headings:* **1. Radio transmission ducts 2. Cardigan Bay.**—*Authors' abstract.*

8J–6 551.593.1:535.4

Bean, B. R., **The geographical and height distribution of the gradient of refractive index.** *Institute of Radio Engineers, N. Y., Proceedings,* 41(4):549–550, April **1953.** 3 charts, 4 refs., eq. **DLC.** Also issued as *U. S. National Bureau of Standards, NBS Report,* No. 1720.—Very brief text accompanying two charts featuring the Feb. and Aug. distribution of the effective earth's radius factor over the U. S. Another chart shows the distribution of refractive index for warm temperate and cold climates. *Subject Heading:* **1. Refractive index distribution.**—*W.N.*

8J–7 551.594.7:621.396.029.6

Bellaire, F. R. and Arvola, W. A. (*both, U. S. Navy Electronics Lab., San Diego*), **Prediction of diurnal field strength patterns by synoptic methods.** (In: Conference on Radio Meteorology, Univ. of Texas, Austin, Nov. 9–12, 1953, **Proceedings,** v. [1]:III-4, pub. **1953.** 7 p. 4 figs.) **DLC, DWB**—Best VHF-UHF propagation to a point beyond the horizon occurs when a shallow layer of moist air lies under a dry layer and the worst conditions occur when air is dry or moist (unstable) to great heights. Southerly flow from Gulf of Mexico, weak pressure gradient, clear skies, veering winds, laminar structure (from Raob data), large diurnal temperature range, fog at night, and light winds give highest signals. Seven flow or air mass classes were designated for correlation with signal strength. Large diurnal variations in signal strength is characteristic of high intensity signals (at night) and low variations with low intensity. Air mass changes are apt to produce greatest deviations of actual from predicted values of diurnal curve. (*Same item as* 7.2–284, Feb. 1956, *MAB.*) *Subject Headings:* **1. Tropospheric propagation 2. Microwave propagation forecasts.**—*M.R.*

8J–8 551.510.52:621.396

Bremmer, H., **The troposphere as a medium for the propagation of radio waves, Pt. 1–2.** *Philips Technical Review,* Eindhoven, Netherlands, 15(5,6):148–159; 175–181, Nov., Dec. **1953.** 10 figs., 24 refs., eqs. **DLC**—For microwave (<10 m) propagation the troposphere below 10 km (or the refraction index in the troposphere), not the ionosphere, has proven to be the most critical region of the atmosphere. Knowledge of this troposphere propagation and of the physical characteristics of the troposphere which affect microwaves is reviewed. Six methods by which microwaves are transmitted are examined: a) along 2 normal paths, one direct and one reflected; b) along a few rays via a transition layer; c) superrefraction (along many rays as in a wave guide) with the troposphere as the wave guide; d) via reflection due to (temperature and humidity) gradient changes; e) by diffraction and f) by scattering. The last named method is discussed in great detail as it is responsible for interference from distant transmitter and hence is the most important factor in assigning wave lengths and spacing of transmitters in order to avoid interference. (*Same item as* 6.6–156, June 1955, *MAB.*) *Subject Headings:* **1. Microwave transmission 2. Tropospheric propagation 3. Refractive index.**—*M.R.*

8J–9 551.501.81:551.524.7:551.571.7

Browne, Ian C., **Radar echoes at vertical incidence from a horizontally stratified atmosphere.** *Royal Meteorological Society, Quarterly Journal,* 79(339):157–160, Jan. **1953.** 2 figs., 8 refs., 4 eqs. **DWB**—On July 12, 1949, on 3.2 cW radar at Cambridge, Eng., an echo (angel) was received from a horizontal layer 300 ft thick at 4560 ft, attributed to a humidity discontinuity of 40% at an anticyclonic inversion. (*Same item as* 4.7–22, July 1953, *MAB.*) *Subject Headings:* **1. Radio echoes 2. Upper air humidity.**—*C.E.P.B.*

8J–10 551.594.7:621.396

Bullington, Kenneth, **Radio transmission beyond the horizon in the 40- to 4,000 Mc band.** *Institute of Radio Engineers, N. Y., Proceedings,* 41(1):146–152, Jan. **1953.** fig., 16 refs., 21 eqs. **DLC**—After defining and calculating the transmission loss, author discusses the subject as related to ionospheric and tropospheric propagation, involving Rayleigh's theory. Latter part of the paper is devoted to the maximum range of a radio system along with noise problems caused by other radios. *Subject Heading:* **1. Radio transmission.**—*W.N.*

8J–11 551.594.7:06

Conference on Radio Meteorology, Univ. of Texas, Austin, Nov. 9–12, 1953, **Proceedings,** [v. 1]. Conference sponsored by The American Meteorological Society, The Institute of Radio Engineers; The Radar Weather Conference; The International Scientific Radio Union; The Joint Commission on Radio Meteorology of the International Scientific Unions. Austin, Bureau of Engineering Research, Univ. of Texas, 1953. Each section repaged. Also **Supplement** (i.e. Vol. 2). pub. **1954.** Each section repaged. **DWB**—In Vol. 1, short version or summaries of 61 papers on Tropospheric propagation; Refractive index; Atmospheric scattering and turbulence; Thunderstorm and tornado atmospherics; Cloud and precipitation physics and Use of weather radar, as presented at the sessions on those topics during the Conference on Radio Meteorology Nov. 9–12, 1953 at Austin, Tex. The remaining papers and supplementary material, discussions etc. comprise the **Supplement** (i.e. Vol. 2) which contains 17 papers on the various aspects of Radio propagation, Radar meteorology, Turbulence, Cloud and thunderstorm physics and 11 pages of discussion on the various subjects covered in the conference, corrections on papers in Vol. I, and a list of names and addresses of the participants. Papers contained herein, by CARROLL, BEAN and MEANEY, OGURA and MIYAKODA, HERBERT JONES, WEIL, NEWMAN and STAHMANN, PIERCE and WORMELL, NEWMAN, E. L. HILL, S. E. REYNOLDS, BEMIS and FLEISHER, EVANS and STONE, BLACKMAN, LIGDA and V. G. MILES are abstracted separately. (For listing of contents of Vol. 1, *see* 5(4):550, April 1954, *MAB* and for

contents of Vol. 2, *see* 5(8):975, Aug. 1954, *MAB.*) (*Same items as* 5:7–3, July 1954 and 6.8–2, Aug. 1955, *MAB.*) *Subject Headings:* **1. Radio meteorology conferences 2. Tropospheric radio wave propagation 3. Cloud physics 4. Austin, Tex.**—*M.R.*

8J–12 551.594.7:621.396

Cowan, Leslie W., **Forecasting refractive index profiles in the atmosphere.** *U. S. Air Force. 3rd Weather Group, Ent Air Force Base, Colorado Springs, Technical Paper*, No. 2, Sept. **1953.** 80 p. 51 figs., 7 tables, 15 refs., 2 eqs. **DWB**—Meteorological factors affecting radar propagation in the troposphere are analyzed and methods of forecasting refractive indexes or superrefraction (or the opposite) conditions set forth. Seasonal air mass and regional variations in nonstandard conditions are treated in detail with profiles, tables, schematic diagrams, nomograms, etc. Limitations of radiosonde observations and effects of radiation or of sea or lake surface in modifying conditions are emphasized. Radio climatological (inversion frequency) data for cities in the U. S. and for the W. Atlantic are included on charts and frequency diagrams. (*Same item as* 7.7–12, July 1956, *MAB.*) *Subject Headings:* **1. Refractive index forecasting 2. Radio climatology 3. Tropospheric propagation 4. United States.**—*M.R.*

8J–13 551.594.7:551.510.52 551.594.7:621.396

Cowan, Leslie W., **Interpreting refractive index profiles in terms of radar coverage.** *U. S. Air Force. 3rd Weather Group, Ent Air Force Base, Colorado Springs, Technical Paper*, No. 3, Oct. **1953.** 99 p. 13 figs., 61 cases, table, 6 refs. **DWB**—A manual giving information and nomograms necessary for calculating refractive index profiles, radio holes and other radar parameters involved in tropospheric propagation with transmitters 2000′, 1000′ above and at base of layer, or 500′ or 1000′ below layer or in surface duct, and for different thicknesses of layer (50′ to 1000′). Special cases of a radar on a coastal peak 3000′ above the sea, and with targets 10,000′ and 20,000′ above transmitter, are considered. (*Same item as* 7.7–13, July 1956, *MAB.*) *Subject Headings:* **1. Tropospheric propagation 2. Refractive index profiles 7. Radio transmission ducts 4. Radio holes.**—*M.R.*

8J–14 551.593.1:535.32

*Crain, Cullen M., **Refractometer measured tropospheric index-of-refraction profiles, Vol. 1.** Texas. Univ. Electrical Engineering Research Laboratory, Contracts AF 18(600)-113 and AF 19(604)-494, Report No. 6-02, Feb. 27, **1953.** 27×40 cm. 7 p. 10+42+31 graphs. **DWB**—Refractometer sounding curves are shown on large sheets of graph paper for airplane soundings made in 1952 to 12,000 ft altitude over S.W. Ohio, off the West Coast of Washington State and west from San Francisco over the Pacific. The peculiarities of the curves are explained in terms of surface stratus layers in marine air off the West Coast, upper layers of superrefractive or subrefractive air or steep gradients caused by air mass discontinuities; either on individual days or as a general seasonal condition. On the whole, conditions were more steady off the West Coast (Aug.–Oct.) than in Ohio (Aug. 1952). (*Same item as* 5.11, Nov. 1954, *MAB.*) *Subject Headings:* **1. Refractive index 2. Air-borne refractometer data 3. Tropospheric refraction 4. Pacific Coast, United States 5. Southern Ohio.**—*M.R.*

8J–15 551.594.7:621.396

Crain, C. M.; Straiton, A. W. and von Rosenberg, C. E., **A statistical survey of atmospheric index-of-refraction variation.** *Institute of Radio Engineers, Transactions*, Vol. AP-1, No. 2:43–46, Oct. **1953.** 8 figs., 2 refs., eqs. **DBS**—This paper presents a statistical survey of index of refraction variations as recorded by an airborne microwave refractometer. Scales and intensities of the index variations are given, as well as the parameters $\Delta N^2/l$, for data taken over southwest Ohio during summer months and over the Pacific Ocean off the west coast of Washington in Aug. and of California in Oct. Heights from 2000 and 12,000 ft msl were considered with most of the data taken between 2000 and 12,000 ft. Approximately, 1200 samples taken on 34 flights were analyzed. The composite of the data gave the following median values:

$$\text{Index scale} = 130 \text{ ft}$$

$$\text{Index intensity} = 0.3\ N$$

$$\frac{\Delta N^2}{l} = 7 \times 10^{-4}\ N^2/\text{ft}$$

Subject Headings: **1. Refractive index 2. Statistical surveys 3. Southwest Ohio 4. Pacific Ocean 5. Washington coast 6. California.**—*Authors' abstract.*

8J–16 551.594.7:551.588.2

Dickson, F. H.; Egli, J. J.; Herbstreit, J. W. and Wickizer, G. S., **Large reductions of VHF transmission loss and fading by the presence of a mountain obstacle in beyond-line-of-sight paths.**

Institute of Radio Engineers, N. Y., Proceedings, 41(8):967–969, Aug. **1953.** 2 figs., 4 refs. **DLC**—Demonstrates how high mountain ridges can be utilized to reduce both transmission loss and tropospheric fading. Experimental verification of principles involved is given here. *Subject Headings:* **1. VHF fading 2. Topographic effects on tropospheric propagation.**—*W.N.*

8J–17 551.594.7

Doherty, L. H., **Effect of atmospheric ducts on line-of-sight transmission.** *U. S. Navy Electronics Laboratory, San Diego, Report,* No. 409:51–55, **1953.** 2 figs. **DWB, DLC**—It is shown that the ray theory may yield satisfactory answers to problems of tropospheric duct propagation. Some meteorological conditions as mechanisms for specific propagation phenomena are discussed. *Subject Heading:* **1. Radio transmission ducts.**—*W.N.*

8J–18 551.594.7:621.396

Epstein, Jess and Peterson, Donald W., **An experimental study of wave propagation at 850 MC.** *Institute of Radio Engineers, N. Y., Proceedings,* 41(5):595–611, May **1953.** 34 figs., 7 tables, 10 refs., eqs. **DLC**—The prediction of area coverage of a broadcast station is of prime importance. To do this requires evaluation of the effect of such factors as wave refraction, earth reflection, diffraction and attenuation. The following paper describes an experiment conducted at 850 mc which was undertaken to solve this problem. We have concluded that useful predictions of wave propagation can be made with free space theoretical field strength reduced by theoretical knife edge diffraction shadow loss and by suitable empirical experience factors. *Subject Headings:* **1. Radio communication range 2. Propagation experiments 3. Radio field strength 4. Tropospheric propagation.**—*Authors' abstract.*

8J–19 551.594.7:621.396

Herbstreit, J. W.; Norton, K. A.; Rice, P. L. and Schafer, G. E., **Radio wave scattering in tropospheric propagation.** *Institute of Radio Engineers, N. Y., Convention Record,* Pt. 2:85–93, **1953.** 6 figs., table, 10 refs., 26 eqs. **DLC** (TK 6541 .I5)—The scattering theory of BOOKER and GORDON has been developed, assuming the correlation function $C(r) = C(O) \exp(-r/l)$, so as to be suitable for easy numerical calculation of the transmission loss expected with this mode of transmission; $C(O)$ denotes the variance with time of the refractive index of the atmosphere and l denotes the scale of turbulence. In this development the parameter $[C(O)/l]$ emerges as a direct measure of the radio wave power transmitted by this mode of propagation. The theory is used to calculate the transmission loss to be expected on the transmission paths involved in the NBS Cheyenne Mountain experiment which cover the transmitting antenna height range from 30 to 7,800 ft, distance range 223 to 628 mi, and frequency range 100–1,046 Mc. The dependence of $[C(O)/l]$ on height above the earth's surface which must be assumed in these predictions to obtain agreement with the experimental transmission loss data is in qualitative agreement with the meager meteorological data which are now available for estimating this parameter. *Subject Headings:* **1. Radio wave scattering 2. Tropospheric propagation.**—*Authors' abstract.*

8J–20 551.594.7:551.48

Hood, A. D. and Doherty, L. H. (*both, Radio and Elec. Engr. Div., Nat'l Res. Council, Ottawa*), **Radar forecasting on Lake Ontario.** (In: Conference on Radio Meteorology, Univ. of Texas, Austin, Nov. 9–12, 1953, **Proceedings,** (V. 1):III-6, pub. **1953.** 7 p. 4 figs. (incl. photos), ref.) **DLC, DWB**—Correlation with duct height as predicted by the power law was compared with the duct height observed at 1830 or 1930 EST, and presented graphically for Aug. and Sept. 1952. The results, excluding days of frontal passage and/or no surface ducts, indicate a maximum value of duct height. No echoes were visible during standard propagation conditions. The diurnal variation is distinct during summer. The 3-cm radar used scanned a 180° sector and gave a vertical view of every 8 ft up to a height of 220 ft every 30 sec. (*Same item as* 6G–127, July 1955, *MAB.*) *Subject Headings:* **1. Radar propagation over lakes 2. Superrefraction 3. Forecasting radar conditions 4. Radar propagation ducts 5. Tropospheric propagation 6. Lake Ontario 7. Scarboro, Ontario.**—*W.N.*

8J–21 551.510.52:621.396:016

†Institute of Radio Engineers. Committee on Wave Propagation, **Tropospheric propagation: a selected guide to the literature.** *Institute of Radio Engineers, Proceedings,* 41(5):588–594, May **1953.** numerous refs. **DWB**—This bibliography is mainly for the non-specialist seeking information on details of tropospheric propagation. The subject arrangement of the contributions reviewed is as follows: books; general discussions; diffraction; refraction (rays, modes and ducts, elevated layers, angle-of-arrival); lobe structure; time and space variations of field strength, attenuation by atmospheric gases and precipitation; ground and sea roughness; meteorological echoes; velocity of propagation. The review is based on American and British sources. (*Same item as* 6B–152, Feb. 1955, *MAB.*) *Subject Heading:* **1. Radio wave propagation bibliographies.**—*G.T.*

8J–22 551.594.7:621.396.029

Jehn, K. H. and Staley, R. C., **Correlations of 100 MC radio propagation with certain meteorological variables.** *Journal of Atmospheric and Terrestrial Physics*, 3(3):163–171, April **1953.** 9 figs., 6 refs. **DWB**—Signal strengths of 100 MC (3m) waves received at Austin, Texas, from San Antonio (78 mi) and Dallas (175 mi), are compared with meteorological data. It is found that high signal strength is associated with maritime tropical and low with polar continental air. Some relations were found with height of base of refracting layer but it is suggested that these were due to the presence of multiple refracting layers. A time-height turbulence plot is shown for San Antonio up to 25,000 ft and some relation is found to signal propagation. (*Same item as* 5.6–289, June 1954, *MAB.*) *Subject Headings:* **1. Short wave radio propagation 2. Texas.**—*C.E.P.B.*

8J–23 551.510.535:551.594.7:681.1

Johnson, Walter E., **Analogue computer for the solution of the radio refractive-index equation.** *U. S. National Bureau of Standards, Journal of Research*, 51(6):335–342, Dec. **1953.** 7 figs., table, 5 refs. **DWB**—The solution to the radio refractive-index equation provides information necessary to the research worker studying tropospheric radio propagation in the very high and ultrahigh regions. Present means of computation are either time consuming or of low accuracy. An analog computer is developed to solve this equation by utilizing basic computation circuits incorporated into a null-balance bridge circuit. A unique feature of this computer is the modification of a linear 10-turn potentiometer so that its output to input voltage ratio versus rotation closely approximates the exponential-type curve of the saturated water-vapor term in the refractive-index equation. This computer is now in use at the Central Radio Propagation Laboratory of the National Bureau of Standards, Boulder, Colo., and has superseded other methods of calculating the radio refractive index. (*Same item as* 5.8–96, Aug. 1954, *MAB.*) *Subject Headings:* **1. Analog computers 2. Tropospheric propagation 3. Refractive index.**—*Author's abstract.*

8J–24 551.508:551.507.321.4

*Lowell, P. D.; Hakkarinen, W. and Randall, D. L., **National Bureau of Standards mobile low-level sounding system.** *U. S. National Bureau of Standards, Journal of Research*, 50(1):7–17, Jan. **1953.** 6 tables, 14 figs., 12 refs. **DWB**—Details of component parts, calibration procedure, flight computations and tests, etc. are given in text, tables, wiring and other schematic diagrams and photographs. The equipment is designed to measure pressure, temperature and moisture distribution and gradients from the surface up to 2000 ft over different types of terrain. It is a combination of an improved wired sonde and Army SCM-1A Mobile Meteorological Station. For obtaining refraction index gradients used in tropospheric radiowave propagation measurements, this system has several advantages over radiosondes (too fast ascent), towers (300–400 ft maximum height) or wired sondes (uncertain height and low ceiling). (*Same item as* 5.4–46, April 1954, *MAB.*) *Subject Headings:* **1. Reproductive index measuring equipment 2. Low level sounding systems 3. Wired sondes.**—*M.R.*

8J–25 551.551:551.557:621.396

Megaw, E. C. S., **Waves and fluctuations.** *Institution of Electrical Engineers, London, Proceedings, Pt. 3*, 100(63):1–8, Jan. **1953.** 9 figs., 14 refs., 2 eqs. **DLC**—This interesting lecture includes sections on turbulence and fluctuations of refractive index, wave propagation through slightly inhomogeneous media, intensity fluctuations or scintillation, and long-range propagation of radio waves by atmospheric scattering. Agreement between theoretical calculation and observations is good. (*Same item as* 4.9–137, Sept. 1953, *MAB.*) *Subject Headings:* **1. High level turbulence 2. Radio wave propagation.**—*C.E.P.B.*

8J–26 551.594.7:621.396.029.6

Naito, K., **On the scattering of the plane electromagnetic wave by a continuous inhomogeneity with spherical symmetry in a homogeneous medium.** *Papers in Meteorology and Geophysics*, Tokyo, 3(4):313–319, March **1953.** 28 eqs., 3 refs. **DWB**—The effect of atmospheric turbulence on microwave propagation is investigated theoretically. After integrating a vector wave equation for a plane wave encountering a continuous inhomogeneity with a spherical symmetry in a homogeneous medium, the author defines the total scattering cross section (i.e. the ratio of the total scattered energy per unit time to the energy density of the incident wave) and finds it to be proportional to the square of a qualitative magnitude of inhomogeneity. *Subject Headings:* **1. Microwave scattering 2. Atmospheric turbulence.**—*G.T.*

8J–27 551.594.7:551.574.1

Naito, K. (*Met. Res. Inst.*), **On the influence of waterdrops in the air upon the atmospheric radio-refractive index.** *Papers in Meteorology and Geophysics*, 4(34):109–114, Dec. **1953.** Summary p. 109. 2 figs., 3 refs., 11 eqs. **DWB**—Radio-refractive index is computed assuming Rayleigh

scattering for a single drop and approximate reactions between scattered waves. Relation to visibility is shown. The resulting effect cannot always be disregarded as it is done in the conventional formula, considering only pressure, temperature and vapor pressure. *Subject Headings:* **1. Refractive index 2. Water drops 3. Visibility.**—*A.A.*

8J–28 551.594.7:621.396

Norton, Kenneth A., **Transmission loss in radio propagation.** *Institute of Radio Engineers, N. Y., Proceedings*, 41(1):146–152, Jan. **1953.** fig., 19 refs., 21 eqs. **DLC**—Ionospheric and tropospheric aspects of the problem are considered. Basis for the discussion is author's definirion of transmission loss to be the ratio of the power radiated from the transmitting antenna to the resulting signal power available from a loss-free receiving antenna. *Subject Heading:* **1. Radio transmission loss.**—*W.N.*

8J–29 551.594.7:621.396

Rice, S. O., **Radio field strength statistical fluctuations beyond the horizon.** *Institute of Radio Engineers, N. Y., Proceedings*, 41(2):274–281, Feb. **1953.** 4 figs., table, 8 refs., 33 eqs. **DLC**—When a sinusoidal radio wave of extremely high frequency is sent out by a transmitter, the wave received far beyond the horizon is often observed to fluctuate. Here some of the statistical properties of this fluctuation are derived on the Booker-Gordon assumption; namely, that the received wave is the sum of many little waves produced when the transmitter beam strikes "scatterers" distributed in the troposphere. Expressions are obtained for the periods of the fluctuations in time, in space, and in frequency. These expressions extend closely related results obtained by BOOKER, RATCLIFFE and others. *Subject Heading:* **1. Microwave field strength fluctuations.**—*Author's abstract.*

8J–30 551.594.7:621.396:551.588.2

Robbins, R. L. (*Bell Telephone Labs., Inc., N. Y.*), **Measurement of path loss between Miami and Key West at 3675 Mc.** *Institute of Radio Engineers, Transactions*, Vol. AP-1, No. 1:5–8, July **1953.** 6 figs., ref. **DBS**—Experimental results over five 130 mi paths are discussed here. The path losses observed, especially over water in semi-tropical areas, were in agreement with those observed in other areas by BULLINGTON. Fore-ground terrains in relation to over-land, over-water paths and elevation of paths showed no difference; likewise, diurnal and short-term signal variations were similar to those observed elsewhere. *Subject Headings:* **1. Microwave propagation 2. Topographic influences 3. Miami, Fla. 4. Key West, Fla.**—*W.N.*

8J–31 551.510.535:621.396.11:621.396.81

Schachenmeier, Richard, **Die Erhöhung der UKW-Empfangsfeldstärke durch eine brechende Schicht. Inversion der Troposphäre.** [The increase in USW field intensity due to a tropospheric inversion layer.] *Archiv der Elektrischen Übertragung*, 7(10):485–491, Oct. **1953.** 5 figs., refs., 41 eqs. **DLC**—Refraction in an inversion layer is considered in terms of an apparent increase in the effective height of the sender. Calculations are made for different elevations of the receiver and sender relative to the inversion layer. The influence of focusing of the radiation in increasing the received field intensity is also considered. *Subject Headings:* **1. Tropospheric propagation 2. Inversions.**—*Electrical Engr. Abstracts, No. 1260, 1954.*

8J–32 551.594.7:535.4

Smith, Ernest K., Jr. and Weintraub, Stanley, **Constants in the equation for atmospheric refractive index at radio frequencies.** *U. S. National Bureau of Standards, Journal of Research*, 50(1):39–41, Jan. **1953.** 2 tables, 21 refs., eqs. **DWB.** Also in: *Institute of Radio Engineers, Proceedings*, 41(8):1035–1037, Aug. **1953.** 21 refs., 11 eqs. **DLC**—Several radio propagation laboratories have made improvements in microwave techniques and hence in the sets of constants used in calculations of atmospheric refraction of radio waves. It is suggested that a compromise set of constants such as are proposed in this article, be adopted universally to avoid confusion hereafter. The expression to be used in Radio meteorology is $N=(77.6/T)[P+4810\ (e/T)]$, where P=total pressure (mb), e=partial pressure of water vapor (mb), T=absolute temperature. This is considered accurate to 0.5% up to 30,000 megacycles at normal atmospheric temperature, pressure and humidity ranges. Values of E-1, N, K_1, K_2, and K_3 obtained by various authors (1931–1952) are tabulated. *Subject Headings:* **1. Refractive index 2. Tropospheric refraction 3. Radio meteorology.**—*M.R.*

8J–33 551.594.7

*Strand, Kaj G., **Investigation of atmospheric refraction at low altitudes.** *U. S. Arctic, Desert, Tropic Information Center, ADTIC Publication*, No. A-102, Feb. **1953.** 36 p. 3 figs., 13 tables,

4 refs. **DWB**—Refractive indexes are computed from observations made in 1951 and 1952 at Dearborn Observatory about 60 ft from the west shore of Lake Michigan near Chicago, supplemented by Joliet radiosonde data for selected days in 1951 and 1952. It is realized that the air over Joliet is not the same as over Lake Michigan, yet conditions at 3000 ft are not so much different that data cannot be used interchangeably. Observations of the Pleiades and Moon were used to determine refraction effect. Techniques are described in detail and illustrated, and meteorological as well as astronomical data presented in full. Pressure, temperature and dew point are used for surface and up to 24,000 ft and tabulated and measured values are compared, indicating that on individual nights observed values may differ by as much as 8% from computed values, when corrections for surface pressure and temperature are applied. (*Same item as* 7.8–255, Aug. 1956, *MAB.*) *Subject Headings:* **1. Atmospheric refraction 2. Astronomical refraction 3. Tropospheric refraction 4. Lake Michigan.**—*M.R.*

8J–34 551.506.7:518.3:621.396.8

Swingle, Donald M., **Nomograms for the computation of tropospheric refractive index.** *Institute of Radio Engineers, Proceedings,* 41(3):385–391, March **1953.** 3 figs., refs., 5 eqs. **DLC**—Three sets of nomograms permitting calculation of tropospheric refractive index gradient are presented. So far as is known, no similar charts have been made for discontinuity and gradient calculations. All three have been designed about the standard radiosonde transmission, which gives temperature, dew-point temperature, and pressure at points where discontinuities occur in the vertical gradients of temperature or dew-point temperature. These nomograms are valid for all wavelengths greater than 1.5 cm. (*Same item as* 5.10–44, Oct. 1954, *MAB.*) *Subject Headings:* **1. Refraction of electromagnetic waves 2. Upper air data 3. Nomograms.**—*Author's abstract.*

8J–35 551.501.81:551.571

Swingle, Donald M. (*Signal Corps Eng. Lab., Fort Monmouth, N. J.*), **Reflections on electromagnetic waves from media of continuously variable refractive index.** (In: Conference on Radio Meteorology, Univ. of Texas, Austin, Nov. 9–12, 1953, **Proceedings,** (V. 1):IV-2, pub. **1953.** 7 p. 3 figs., 6 refs., 17 eqs. **DLC, DWB**—The theoretical analysis presented is based on the assumption of small change in the refractive index and gives a good approximation of the lower atmosphere where the maximum possible change is of the order of 0.3%. Extension of the analysis may permit inclusion of both large changes of index and spherical waves. The method may be applicable to situations where no direct discontinuity of the refractive index occurs. It is shown that a plane-wave pulse containing an integral number of cycles, propagating through a region of constant refractive index gradients, produces no reflection. (*Same item as* 6G–158, July 1955, *MAB.*) *Subject Headings:* **1. Radar reflections from discontinuities 2. Refractive index discontinuities 3. Tropospheric propagation.**—*W.N.*

8J–36 551.594.7(02)

U. S. Army, **Antennas and radio propagation.** Its *Technical Manual TM* 11-666, Feb. **1953.** 225 p. 197 figs., tables. **DWB** (MO8 U58t)—The basic principles of radio propagation are clearly presented, with many lucid schematic diagrams, in Ch. 2 of this comprehensive manual. Ground wave propagation, the ionosphere, and sky-wave propagation are taken up in 3 sections of Ch. 2, and scores of definitions and questions appended in a fourth section. The various types of tropospheric propagation (temp. inversions, humidity lapses, etc.) and ionospheric reflection from O, E & F layers, day and night and with solar flares, 11 year and 27 day cycles, Sporadic E, etc. are outlined. The section on ionization and the formation and behaviour of the ionosphere are especially useful for beginner or layman. *Subject Headings:* **1. Radio wave propagation 2. Tropospheric propagation 3. Manuals.**—*M.R.*

8J–37 551.594.7(08)

U. S. Navy Electronics Laboratory, San Diego, California, **Symposium on tropospheric wave propagation within the horizon, March 30–April 2, 1953.** Its *Report,* 409, Sept. 3, **1953.** 72 p. figs., tables, refs., eqs. **DLC**—The symposium was divided into 3 sessions during which 14 papers were delivered as follows: (1) Terrain effects (5 papers); (2) Refraction effects (6 papers); (3) Combined and other effects (3 papers). These papers are reproduced in full or in abstract in this report which also includes a list of names of all participants. *Subject Headings:* **1. Microwave propagation symposia 2. San Diego, Calif.**—*W.N.*

8J–38 551.594.7:551.551

Voge, Jean, **Fluctuations du champ électromagnétique dues à la turbulence, à l'extrémité d'un trajet de propagation en visibilité directe.** [Fluctuations of the electromagnetic field due to turbulence on the end of a propagation trajectory with direct visibility.] *Académie des Sciences, Paris, Comptes Rendus,* 237(4):351–353, July 27, **1953.** 3 refs. **DWB**—Theoretical discussion for ultra-

short waves and light waves, applying the TAYLOR spectrum of turbulence, which gives simpler solutions than proposed by MEGAW, who used KOLMOGOROV's spectrum. (*Same item as* 6.3–161, March 1955, *MAB.*) *Subject Headings:* **1. Turbulence spectrum 2. Radio meteorology.**—*A.A.*

8J–39 551.594.7:551.524.4

Voge, Jean, **Fadings et pertes de contact en ondes ultra-courtes, dus à la présence de couches d'inversion.** [Fadings and disruptions of contact in ultra-short-wave communication, due to inversion layers.] *Académie des Sciences, Paris, Comptes Rendus,* 237(9):491–493, Aug. 31, **1953.** 3 refs. **DWB**—Results of a theoretical investigation of direct (standard) radio communication conditions associated with inversions are summed up for various cases involving different relative positions of the communicating stations and of inversion layers. *Subject Headings:* **1. Radio fading patterns 2. Inversions.**—*G.T.*

8J–40 551.594.7:621.396:681.143

Weintraub, Stanley, **Slide rule computes radio refractive index of air.** *Electronics,* 26(1):182, 186, 190, 194, 196, 198, 200, Jan. **1953.** 3 figs., 2 refs., eqs. **DLC**—The slide rule described and illustrated is claimed to have a precision of ±0.5 N-units under almost any conditions encountered in the troposphere. The slide rule was developed by the U. S. National Bureau of Standards and facilitates tropospheric propagation studies. *Subject Headings:* **1. Slide rules 2. Refractive index computations 3. U. S. National Bureau of Standards.**—*W.N.*

1954

8J–41 551.594.7:621.396

Barsis, A. P., **Comparative 100 Mc measurements at distances far beyond the radio horizon.** *Institute of Radio Engineers, N. Y., Convention Record,* Pt. 1:98–107, **1954.** 10 figs., 5 refs. **DLC** (TK 6541 .I5)—Results of 100 Mc measurements are evaluated in terms of distributions of hourly medians of transmission loss. Transmitters were located at elevations of approximately 6200, 8800 and 14,100 f.a.m.s.l. on the eastern slope of the Rocky Mountains. Receiving sites were located at distances of 230 and 400 mi from the transmitters. Various types of antennas were employed for transmitting and receiving. The results of studies of fading rate and fading range are reported for the 400 mi site by comparing signals received simultaneously on two different antennas. These results are compared to those expected from the application of the tropospheric scattering theory. *Subject Headings:* **1. Radio propagation beyond the horizon 2. Radio fading.**—*Author's abstract.*

8J–42 551.594.7:551.510.52:621.396.029

Bean, Bradford R. and Meaney, Frances M. (*both, National Bureau of Standards, Boulder, Colo.*), **The monthly refractivity gradient for the United States and its application to predicting the geographical and annual trend of VHF transmission loss.** (In: Conference on Radio Meteorology, Nov. 9–12, 1953, Univ. of Texas, **Supplement to the Proceedings,** III-2, pub. **1954.** 11 p. 5 figs., table, 4 refs., 2 eqs.) **DWB** (M94.7 C748p Sup.)—Climatological studies of VHF propagation conditions all over the U. S. are under way, using the simple parameter ΔN (refractivity gradient from surface to k km above the surface) to correlate with the transmission loss over the propagation path whose midpoint is over the weather station in question. Other causes must be taken into account (roughness, distance, height of antenna, etc.). The present method reduces the month-to-month and station-to-station uncertainty by taking out the average climatic effect. Tables and curves based on 1950–52 data show effectiveness of method and amount of variation. (*Same item as* 7.3–297, Mar. 1956, *MAB.*) *Subject Headings:* **1. Tropospheric propagation 2. Refractivity gradient climatology 3. United States.**—*M.R.*

8J–43 551.594.7:621.396

Bean, Bradford R., **Prolonged space-wave fadeouts at 1,046 Mc observed in Cheyenne Mountain propagation program.** *Institute of Radio Engineers, N. Y., Proceedings,* 42(5):848–853, May **1954.** 8 figs., table, 3 refs., eq. **DLC**—During the first year of continuous operation of the Cheyenne Mountain propagation program, recordings of 1,046 Mc fields at receiving locations within the radio horizon have exhibited "fadeouts" or prolonged periods of attenuation often in excess of 20 db below the monthly meridian level and lasting from a minute up to several hours. The occurrence of these fadeouts has been found to coincide with widespread superrefraction as evidenced by enhanced signals beyond the radio horizon and ground modification of the refractive index profile. *Subject Headings:* **1. Radio fading 2. Superrefraction.**—*Author's abstract.*

8J–44 551.594.7:621.396:551.5882.

Bremmer, H., **The extension of Sommerfield's formula for the propagation of radio waves over a flat earth, to different conductivities of the soil.** *Physica,* Amsterdam, 20(8):441–460, Aug. **1954.** 4 figs., 6 refs., 54 eqs. **DLC** (QC1 .P38)—The influence of non-homogeneous soil conditions on the

propagation of radio waves over a flat earth is investigated with the aid of an integral equation based on Green's theorem. This equation applies to all types of distributions (also continuous) of the conductivity and of the dielectric constant of the earth; it is essentially identical with the integral equation considered by HUFFORD for the propagation over irregular terrain. *Subject Headings:* **1. Tropospheric propagation 2. Topographic influences 3. Radio wave scattering theories.**—*From author's abstract.*

8J–45 551.594.7:621.396

Carroll, T. J., **Overcoming the line-of-sight shibboleth with the air and high power.** *Institute of Radio Engineers, N. Y., Convention Record*, Pt. 1:121–125, **1954.** 3 refs. **DLC**—A general review is given of the role of atmospheric inhomogeneity, tropospheric layers and ducts, and atmospheric turbulence, in the propagation of VHF and UHF propagation well beyond the horizon. Implications for TV are discussed. *Subject Heading:* **1. Radio propagation beyond the horizon.**—*G.T.*

8J–46 551.594.7

Carroll, Thomas J. (*M.I.T.*), **Tropospheric propagation well beyond the horizon: a review.** (In: Conference on Radio Meteorology, Nov. 9–12, 1953, Univ. of Texas, **Supplement to the Proceedings,** I-1, pub. **1954.** 7 p. fig., 2 refs.) **DWB** (M94.7 C748p Sup.)—The author reviews the basic discoveries that radio waves would propagate well beyond the horizon or the theoretical distance calculated by mathematical formulas. The 4/3 (earth's radius) law did not explain atmospheric effects produced by anomalous temperature and humidity structure. Superrefraction, effect of turbulence in scattering rays into the twilight zone, the duct theory (modes in the dielectric layer), and effect of roughness of earth are considered. The mode theory operates well enough except when turbulent layers exist over the midpoint of the path—then an even greater degree of propagation (though erratic) to distances can exist. Typical propagation measurements for 93, 410 and 3000 Mc are shown on curves for distances up to 400 km. Isolated measurements at 1047, 3700 and 9375 Mc are also shown on chart and all are compared with the theoretical curves for geometrical horizon, the 4/3 radius for 300 Mc, the 4 1/3 radius for 50 Mc and free space (vacuum), respectively. *Subject Heading:* **1. Tropospheric propagation beyond the horizon.**—*M.R.*

8J–47 551.594.7:621.396

Crain, C. M.; Gerhardt, J. R. and Williams, C. E. (*all, Univ. of Texas, Austin*), **A preliminary survey of tropospheric refractive index measurements for U. S. interior and coastal regions.** *Institute of Radio Engineers, Transactions*, Vol. AP-2, No. 1:15–22, Jan. **1954.** 9 figs., 5 refs. **DBS**—This paper summarizes the results of approximately 700 tropospheric refractive index soundings carried out between July 1952 and Dec. 1952, using aircraft-mounted direct-reading refractometers. Extensive observations up to heights as great as 25,000 ft have been made in the Southern Ohio region and off the U. S. east and west coasts. Preliminary statistical analyses on the occurrence of standard and non-standard average gradients are presented together with qualitative meteorological correlations. The existence of large scale index variations near certain cloud boundaries is confirmed and these are tentatively explained in terms of the contrast between the free air refractive index and that of a vertically moving air current having a refractive index representative of some lower atmospheric level. *Subject Headings:* **1. Refractive index 2. Statistical analysis 3. Southern Ohio 4. East Coast, U. S. 5. West Coast, U. S.**—*Author's abstract.*

8J–48 551.594.7:621.396

Feinstein, J., **Some information theory aspects of propagation through time varying media.** *Institute of Radio Engineers, N. Y., Convention Record*, Pt. 1:87–97, **1954.** 3 figs., 9 refs., 69 eqs. **DLC**—The channel capacity of a communications system which utilizes wave propagation through a time varying medium such as the ionosphere or troposphere is evaluated in terms of the statistical properties of the medium and of the noise. The signal fading in such a system reduces the capacity. Information theory concepts are broadened to include the possibility of multiple reception at spaced receiving sites, and the consequent increase in theoretical channel capacity is computed as a function of the number of such sites. Current practices in the use of diversity reception and directional antennas are examined in the light of these results. *Subject Headings:* **1. Radio communication 2. Microwave propagation.**—*Author's abstract.*

8J–49 551.594.7:621.396.029.6

Feinstein, Joseph (*U. S. Natl. Bureau of Standards*), **Some stochastic problems in wave propagation, Pt. 1.** *Institute of Radio Engineers, Transactions*, Vol. AP-2, No. 1:23–30, Jan. **1954. Pt. 2.** *Ibid.*, Vol. AP-2, No. 2:63–70, April **1954.** 6 figs., 87 eqs. **DBS**—This theoretical discussion deals first with some effects of random height variations over a conductive surface upon reflected wave energy, using methods of physical optics. Several aspects are determined. Next the author treats the effects of the refractive index fluctuations on an emergent front within volume and sub-

sequently generalized to a continuous medium. The effects upon properties of traversing waves are discussed in Pt. 2. The results as applied to some tropospheric and ionospheric problems are then discussed and found indicative and applicable. *Subject Headings:* **1. Microwave propagation studies 2. Refractive index.**—*W.N.*

8J–50 551.594.7:551.588.2

Fine, Harry, **An effective ground conductivity map for continental U. S.** *Institute of Radio Engineers, N. Y., Proceedings*, 42(9):1405–1408, Sept. **1954.** fig., table. **DLC**—Derivation and accuracy of the map adopted by the Federal Communications Commission for use as of April 1954 is discussed here. The map, designed on a 1 to 2,500,000 scale, features not less than 7000 paths throughout the country. The true effective median path conductivity for distances less than 25 mi from transmitter is within 0.59 and 1.7 of the values plotted. The map is available from the Govt. Print. Off., Wash., D. C. for $3.50 a copy. *Subject Headings:* **1. Radio communication 2. Topographic influences 3. Ground conductivity maps.**—*W.N.*

8J–51 551.524.4:551.594.7

Gibbs, W. J., **Meteorological aspects of microwave propagation in Australia.** *Australia. Meteorological Branch, Meteorological Study*, No. 1, June **1954.** 14 p. 13 figs., 6 refs., 12 eqs. **DWB**—Superrefraction will occur in the lowest layers of the atmosphere where there is a strong temperature inversion (>0.14°C/m), a moderate temperature inversion and lapse of humidity, or a strong lapse of humidity (vapor pressure gradient > −0.3 mb/m). In Australia, superrefraction is likely to be associated with the "coastal front" (continental air overlying denser marine air), subsidence inversions, inversions in continental air modified over the sea, and nocturnal radiation inversions. Typical profiles of temperature, vapor pressure, and refractive index gradient are shown. (*Same item as* 7F–186, June 1956, *MAB.*) *Subject Headings:* **1. Inversion effects on radio wave propagation 2. Superrefraction 3. Australia.**—*R. S. Quiroz.*

8J–52 551.594.7

Grant, Arthur S. G. (*Met. Service of Canada, Ottawa*), **Notes on the atmospheric refractive index in Canada from aircraft meteorological soundings.** *American Geophysical Union, Transactions*, 35(3):508–510, June **1954.** 3 figs., 4 refs. **DLC**—Calculations of the atmospheric refractive index for radio waves were made from aircraft soundings over a large area of northern Canada in connection with the 1952 season of the shoran survey. A comparison is made between the results and the NACA 60 pct relative humidity standard atmosphere. (*Same item as* 6.2–327, Feb. 1955, *MAB.*) *Subject Headings:* **1. Refractive index 2. Atmospheric refraction 3. Radio waves 4. Northern Canada.**—*Author's abstract.*

8J–53 621.397.8:551.5 551.594.7

Kazanský, B., **Vliv povětrnostních poměrů na televisní příjem.** [Influence of weather conditions on television reception.] *Meteorologické Zprávy*, Prague, 7(2):53–55, 1954. **DLC.** From the Russian original by M. Dolukhanov in *Radio*, No. 9:41–44, 1952.—Sums up knowledge on ultrashort radio wave propagation beyond the horizon and its meteorological causes. Television reception beyond the normal range is attributed mainly to abnormal refraction and sudden drops in temperature. *Subject Headings:* **1. Television reception 2. Ultrashort wave propagation. I. Dolukhanov, M.**—*G.T.*

8J–54 551.594.7:621.396

Kirby, R. S.; Harman, J. C.; Capps, F. M. and Jones, R. N., **Effective radio ground-conductivity measurements in the United States.** *U. S. National Bureau of Standards, Circular* 546, Feb. 26, **1954.** 87 p. almost entirely maps. **DLC**—Maps are presented showing the results of effective ground-conductivity measurements made by various broadcasters and consulting engineers throughout the United States. Over 7000 radials are shown on the maps, and provisions have been made for entering new measurements, as the results become available. Due to the complexity of groundwave propagation over an inhomogeneous earth, the determination of effective ground conductivity over a given radial strictly applies only at the frequency at which the measurements were made. *Subject Headings:* **1. Ground-conductivity measurements 2. Ground conductivity maps.**—*From authors' abstract.*

8J–55 551.594.7

Lauter, E. A. and Klinker, L., **Long distance U. S. W. reception.** *Nachrichten Technik*, 4(6): 242–247, June **1954.** Records of field strength measurements made at Kühlungsborn since 1951 are analyzed in respect of diurnal variations of mean level, sudden changes in level, and rapid fluctuations. Data cover transmissions in the 87.5–100 Mc band over two 200 km land paths and one 180 km sea path, and hourly records of some 30 transmissions over distances 50–500 km. Refraction

theory accounts satisfactorily for propagation over distances up to three times the optical range; partial reflections can give field strengths below the horizon only 20–30 db below the level for free-space propagation; relatively high mean field strength at great distances during unstable atmospheric conditions is ascribed to scattering process. *Subject Headings:* **1. Propagation experiments 2. Radio field strength fluctuations 3. Radio communication range.**—*Abstract from Wireless Engineer.*

8J–56 551.594.7:016

†Peterson, D. W., **Bibliography of non-contract literature on tropospheric propagation.** Radio Corporation of America. Engineering Products Div., Camden, N. J., Contract DA-36-039-Sc-5663, **Study of Army Television Problems,** Vol. 3, May 15, **1954.** 146 p.—The bibliography contains about 500 entries comprising *IRE* abstracts, and other American symposium, reports and dissertations during the period 1949 and well into 1953. It may be regarded as a supplement to the Cornell Univ. Final Report, Pt. I **Bibliography of reports on tropospheric propagation** (*see* item 8I–107, *MAB*). The annotated references are listed in chronological order, cross-referenced by the author index and an excellent subject index. *Subject Heading:* **1. Tropospheric propagation bibliographies. II. Radio Corporation of America.**—*W.N.*

8J–57 551.594.7:621.396.029

Randall, D. L. (*National Bureau of Standards, Washington, D. C.*), **A study of some of the meteorological effects on radio propagation at 96.3 Mc between Richmond, Va. and Washington, D. C.** *American Meteorological Society, Bulletin,* 35(2):56–59, Feb. **1954.** 4 figs., 4 refs. **DWB**—This study was made to investigate the relationship of surface meteorological data and corresponding surface refractive indices to radio field strengths in the FM frequency band. For meteorological observations during which the wind speeds were equal to or greater than 10 mph, and when fronts, low overcast clouds (less than 5000 ft), rain, thunderstorms and fogs were excluded, a 0.70 correlation coefficient was found between hourly surface refractive index and hourly median field strength over a Washington-Richmond path at a frequency of 96.3 Mc. (*Same item as* 5J–143, Oct. 1954, *MAB.*) *Subject Headings:* **1. Meteorological effects 2. Short wave radio propagation 3. Refractive index 4. Richmond, Va. 5. Washington, D. C.**—*Author's abstract.*

8J–58 551.594.7:621.396

Riddle, R. L. and Ammerman, C. R. (*both, Penna. State Univ., Dept. of Elec. Engr.*), **A preliminary study of fading of 100 Megacycle FM signals.** *Institute of Radio Engineers, Transactions,* Vol. AP-2, No. 1:30–34, Jan. **1954.** 7 figs., 9 refs., eqs. **DBS**—This analytical study includes experimental transmission data from the mountainous path between Pittsburgh, Pa. and State College, Pa. The tropospheric scatter volume in this path is about 39 mi west of State College and at about 3800 ft altitude. BOOKER and GORDON's troposphere model is strengthened. It is indicated that this study is an embryonal method of continuous measurements of wind velocities and/or to determine the extent to which turbulence is present. *Subject Headings:* **1. Microwave propagation 2. Tropospheric layers 3. Pittsburgh, Pa. 4. State College (University Park), Pa.**—*W.N.*

8J–59 551.594.7:621.396

Straiton, A. W.; Gerhardt, J. R. and Tolbert, C. W., **Propagation of millimeter radio waves in low-level overwater ducts.** Texas. Univ. Electrical Engineering Research Lab., Contract Nonr 375 (01), Report, No. 74, Oct. 15, **1954.** 19 p. 12+8 figs. (incl. photos), table, 14 refs. **DWB**—Radio signal strength measurements are reported for propagation tests in a low-level overwater duct. A wavelength of 4.3 mm was used on a 7-mi path, a wavelength of 8.6 mm on paths up to 24 mi and a wavelength of 3.2 cm on paths up to 44 mi. All transmitter and receiver heights used were less than 15 ft. The signal level was found to be less than the free space value with decay rates per mile given approximately as follows:

Wavelength	Decay Rate in db per Mile Relative to Free Space	Theoretical Oxygen and Water Vapor Loss in db per Mile
4.3 mm	3	2.0
8.6 mm	0.7	0.4
3.2 mm	0.3	0.0

The fluctuation range increased sharply as the wavelength decreased from 3.2 cm to 8.6 mm and increased still more as the wavelength decreased to 4.3 mm. The range of the fluctuation also increased approximately in proportion to distance. *Subject Headings:* **1. Radio transmission ducts. 2. Radio wave propagation.**—*Author's abstract.*

8J–60 551.594.7:551.510.52

Tao, Kazuhiko (*Radio Res. Labs., Tokyo*), **On the propagation of ultra short waves beyond the horizon.** *Japanese Journal of Geophysics,* Tokyo, 1(1):27–79, May **1954.** 41 figs., 2 tables

(1 fold.), 42 refs., numerous eqs. **DWB**—A long and thorough paper covering in the first part (p. 28–57) the theory of tropospheric propagation of high frequency radio waves beyond the horizon, considering 3 types of propagation conditions: diffraction by a discontinuity, reflection from a nocturnal inversion (at 150–300 m height, as a rule), and double reflection from an inversion and the ground. Field strength-distance curves are given in 4 elaborate nomograms, and schematic models presented to illustrate relation of field strength to various vertical profiles. In the second part the observed variations of field strength between Kokubunji and Hiraiso, crossing Tateno Geological Observatory, are analyzed to find seasonal, diurnal, and meteorological variations of 150 and 60 Mc/sec waves. Examples are described and illustrated. Daily aerological soundings at Tateno furnished refractive index data for noontime, and captive balloons were used on Nov. 17, 18, 20 and 22, 1952 to obtain diurnal variations in refractive index gradient up to 200 m. The conclusion was that thin layers (20, 40, or 60 m thick, for instance) do not carry the maximum signal strength, but that layers about 160 m thick are optimum. Signal strength is usually weakest about noon and reaches a remarkably high value at night. This latter cannot be explained by a linear refraction-diffraction theory, so a bilinear theory is proposed. Signals are stable when atmosphere is stable and vice versa. Conditions during different types of air masses and during passage of fronts are discussed and illustrated by 3-hourly synoptic charts for Nov. 17, 18 and 20, 1952, and time cross sections of mixing ratio and potential temperature as well as hourly refractive index profiles and Δn, ΔT, $\Delta\theta$, and other parameter curves. (*Same item as* 7.6–11, June 1956, *MAB.*) *Subject Headings:* **1. Ultrashort wave propagation 2. Tateno, Japan.**—*M.R.*

8J–61 551.594.7

Tolbert, C. W.; Britt, C. O.; Tipton, C. D. and Straiton, A. W., **Propagation of 4.3-millimeter radio waves on 3.5- and 7-mile paths.** Texas. Univ. Electrical Engineering Research Laboratory, Contract Nonr 375(01), Contract Nonr 071 032, Report No. 73, Aug. 6, **1954.** 15 p. 8 figs., 5 refs. Available ASTIA, AD 38950—Propagation measurements are reported for frequencies of 69.5 and 70.1 kilomegacycles per second over 3.5 and 7 mile paths in the vicinity of Austin, Tex. These measurements indicate that the oxygen absorption is somewhat less than that predicted by Van Vleck (1) Whereas the water vapor absorption is several times that predicted. The magnetron transmitter, the crystal video receiver, and the associated equipment used for the test are described in the report. *Subject Heading:* **1. Radio wave propagation.**—*Authors' abstract.*

8J–62 551.594.7

U. S. National Bureau of Standards, **Study of tropospheric propagation of radio waves.** Contract DA 3-99-03-022, Contract Sc-MIPR R-54-69-Sc-91, Quarterly Progress Report, No. 1, April 1–June 30, **1954.** 4 p. Also issued as its *Report*, No. 3502. **DWB.** Also, Quarterly Progress Report, No. 2, July 1–Sept. 30, **1954.** Its *Report* 3508. 6 p. table.—Brief report on initial experiments of beyond-horizon propagation and low level meteorological observations as conducted at Cheyenne Mountain and from a 500 ft tower at Haswell, Colo. Field intensity and meteorological measurements from 20,000 ft to ground level were obtained by using a B-17 aircraft. Analysis and evaluation of data obtained too early to report on. *Subject Headings:* **1. Tropospheric propagation. I. Hornberg, K. O.**—*W.N.*

1955

8J–63 551.594.7:551.510.52

Ames, L. A.; Newman, P. and Rogers, T. F. (*all, Air Force Cambridge Res. Center, Mass.*), **VHF tropospheric overwater measurements far beyond the radio horizon.** *Institute of Radio Engineers, N. Y., Proceedings*, 43(10):1369–1373, Oct. **1955.** 6 figs., 13 refs. **DLC**—Using a high-power radar-type transmitter near Boston, Mass., point to-point measurements have been made at a frequency of 220 mcps on 200- and 400-statute-mi overwater paths extending along the east coast. Comparisons are made with similar data available for overland paths. Correlations between the shorter path field-strength data and sea echo back-scatter near the transmitter site are indicated. Airborne field-strength measurements have also been made out across the North Atlantic Ocean to a distance in excess of 400 mi; the variation of field strength with distance is graphically displayed by this technique. (*Same item as* 7.8–275, Aug. 1956, *MAB.*) *Subject Headings:* **1. Tropospheric propagation over water 2. Radio wave propagation.**—*Authors' abstract.*

8J–64 621.396:551.594.7

Aono, Yuichiro and Muramatsu, Kinya, **Measurement of field intensity of ground wave over mixed paths.** *Japan. Radio Research Laboratories, Tokyo, Journal*, 2(7):51–58, Jan. **1955.** 10 figs., 2 tables, 13 refs. **DWB**—This paper describes the results of the measurement carried out near Tokyo of the field intensity of ground wave on the frequencies 1.85, 2.5 and 4 Mc. The measured values are compared with the calculated values after the methods developed by a number of workers. From this comparison it is derived that the new theory which has been developed theoretically by

K. FURUTSU, a member of our Laboratories in cooperation with the experiments, can give the most reasonable explanation to the propagation characteristics of ground wave. *Subject Headings:* **1. Radio wave propagation 2. Tokyo, Japan.**—*Authors' abstract.*

8J–65 551.594.7:621.396

Barghausen, A. E.; Decker, M. T. and Maloney, L. J., **Measurements of correlation, height gain, and path antenna gain at 1046 megacycles on spaced antennas far beyond the radio horizon.** *Institute of Radio Engineers, N. Y., Convention Record*, Pt. 1:78–81, 1955. 5 figs. **DLC** (TK 6541 .I5) —Studies made and reported by the National Bureau of Standards in 1953 on the correlation of 1046 Mc radio fields on spaced antennas at distances far beyond the radio horizon are supplemented by more recent measurements. Measurements were made on the NBS Cheyenne Mountain transmission path in Colo. and Kans. at a frequency of 1046 Mc, the receiving location being at an angular distance of 27 milliradians (for standard atmosphere), i.e. approximately 150 mi beyond the transmitter radio horizon. In addition to the correlation of instantaneous fields, the correlation of hourly median fields and the diurnal variation of the received signal are shown. *Subject Headings:* **1. Radio propagation beyond the horizon 2. Cheyenne Mts., Colo.**—*From authors' abstract.*

8J–66 551.594.7:621.396.9

Barsis, A. P.; Bean, B. R. and Hornberg, K. O., **Cheyenne Mountain tropospheric propagation data, Feb.–March 1954.** *U. S. National Bureau of Standards, Report*, No. 3536, May 1, 1955. 13 p. 38 figs., 3 refs., eqs., tables. **DWB**—This report describes tropospheric propagation measurements taken over the Cheyenne Mountain paths on frequencies between 92 and 1046 Mc during Feb. 1954. The results of measurements are given in terms of cumulative distributions of hourly medians (in units of basic transmission loss). Diurnal variations and interdecile range of hourly medians of transmission loss, and dependence of the above quantities on the angular distance θ. Result of meteorological measurements on the 500-ft tower at Haswell, Colo., are also shown together with radiosonde data obtained at Denver, Colo., and Dodge City, Kans., during the recording period. A general description of the weather during the measurement period is also given. *Subject Headings:* **1. Tropospheric propagation data 2. Cheyenne Mts., Colo.**—*Authors' abstract.*

8J–67 551.594.7:621.396.9

Bean, B. R. (*Central Radio Propagation Lab., National Bureau of Standards, Boulder, Colo.*) and Meaney, F. M. (*formerly of same lab.*), **Some applications of the monthly median refractivity gradient in tropospheric propagation.** *Institute of Radio Engineers, N. Y., Proceedings*, 43(10):1419–1431, Oct. 1955. 9 figs., 6 tables, 12 refs., numerous eqs. **DLC**—A consistent correlation has been found between the monthly median values of 100 mc transmission loss and an atmospheric parameter ΔN which is determined from standard radiosonde observations. ΔN is defined as the difference between the refractivity at the earth's surface and at one kilometer above the earth's surface. ΔN is determined from the midpoint of the propagation path and is taken to represent an effective gradient of the refractive index. It is found to yield correlation coefficients with transmission loss of about 0.7 even in the far scattering region. This correlation is also used to derive estimates of the annual, geographic, and terrain variances of the transmission loss. Six-year average values of ΔN are presented for the United States and can be used as an aid in the prediction of the annual cycle of 100 mc transmission loss. The possibility of using surface observations of N for times of day other than the radiosonde observation hours is examined and found to be encouraging. One of the major conclusions is that the observed dependence of transmission loss upon ΔN is five times greater than that indicated by standard propagation theory. *Subject Headings:* **1. Radio transmission ducts 2. Refraction of electromagnetic waves.**—*Authors' abstract.*

8J–68 535.4:551.593.1

†Birnbaum, George and Bussey, H. E. (*both, Nat'l Bureau of Standards, Boulder, Colo.*), **Amplitude, scale, and spectrum of refractive index inhomogeneities in the first 125 meters of the atmosphere.** *Institute of Radio Engineers, N. Y., Proceedings*, 43(10):1412–1418, Oct. 1955. 3 figs., 2 tables, 13 refs., eqs. **DLC**—An extensive series of observations was obtained with two refractometers and meteorological equipment installed on various levels of a 128-m tower at the Brookhaven National Laboratory, Long Island, New York. One of the refractometers was equipped with a multiple cavity unit for the study of correlation between two positions in the horizontal direction. The errors arising from the exposure of the cavity to the atmosphere and its ventilation were investigated. The amplitude of the refractive index variations could be correlated with various meteorological conditions. From the experimentally determined cross-correlation coefficient, and assuming that its variation with distance is given by the exponential (Taylor) form, scales in the neighborhood of 60 m were obtained. A crude analysis of the data indicated that the intensity of the refractive index inhomogeneities varied, on the average, as the 1.6 power of their size. (*Same item as* 7.8–254, Aug. 1956, *MAB.*) *Subject Headings:* **1. Refractive index 2. Refractometers.** —*Authors' abstract.*

8J–69 551.594.7:551.510.52:621.396

Booker, H. G. and de Bettencourt, J. T. (*both, M.I.T.*), **Theory of radio transmission by tropospheric scattering using very narrow beams.** *Institute of Radio Engineers, N. Y., Proceedings,* 43(3):281–290, March **1955.** 16 figs., 8 refs., 36 eqs. **DWB**—Calculations have been made for communication over a 300-km path between antennas, each consisting of a paraboloid of diameter 100 λ. It is assumed that, under normal atmospheric conditions, transmission over this distance is due to scattering by atmospheric irregularities and that the scattering phenomena are described by the formula used by BOOKER and GORDON. Over this path, the effect of spread in the direction of arrival of scattered power should become noticeable for beamwidths less than about 1.5 degrees. For the 0.73 degree-beams assumed, spread in the angle of arrival should show up quite markedly for synchronized beam swinging—that is, when the beams at both transmitter and receiver are swung simultaneously so that their axes continue to intersect. When the beams are swung 1 degree to one side of the great circle path, the reduction in power received should be about 7 db, as compared with more than 40 db that would occur for propagation purely in the vertical plane containing transmitter and receiver. Narrowing the antenna beams to very small values is an important key to increasing circuit radio-frequency bandwidth capability, although at the expense of increasing antenna "aperture-medium coupling loss" (so-called "gain loss"). For the assumed circuit average bandwidth should be about 6 mcp, the loss being of the order of 10 db. For beams much larger than 5 degrees, the bandwidth should be limited by the medium to about 3 mcp, with negligible loss. General formulas are given from which the important characteristics of any such communication link can be predicted. *Subject Headings:* **1. Radio transmission 2. Tropospheric scattering.**—*Authors' abstract.*

8J–70 551.594.7:621.396

Bullington, Kenneth; Inkster, W. J. and Durkee, A. L., **Results of propagation tests at 505 mc and 4,090 mc on beyond-horizon paths.** *Institute of Radio Engineers, N. Y., Proceedings,* 43(10): 1306–1316, Oct. **1955.** 18 figs., 3 tables, 2 refs. **DLC**—This paper gives the results of some radio propagation tests which were made on two beyond-horizon paths in Newfoundland. During these tests simultaneous transmissions at 505 mc and 4,090 mc over a 150-naut mi path were measured for a full year, and transmission at 505 mc over a 255 mi path was measured for a period of 5 months. Both of these paths were partly over land and partly over water. Long term median signal levels and fading statistics for the two paths are given, as well as the results of some measurements of the improvement obtained from space diversity reception and the gain realized from large (28 ft) antennas on the 150 mi path. The test results provide further evidence of the feasibility of using UHF beyond-horizon links in communication systems. (*Same item as* 7.8–277, Aug. 1956, *MAB.*) *Subject Headings:* **1. Radio wave propagation 2. Radio fading 3. Newfoundland.**—*Authors' abstract.*

8J–71 551.594.7:551.510.52:621.396

†Bullington, Kenneth (*Bell Telephone Labs., N. Y.*), **Characteristics of beyond-the-horizon radio transmission.** *Institute of Radio Engineers, N. Y., Proceedings,* 43(10):1175–1180, Oct. **1955.** figs., 35 refs. **DLC**—This paper summarizes the principal characteristics of tropospheric transmission beyond the horizon and compares them with some of the properties of ionospheric scatter transmission. Quantitative results are given on the dependence of the average signal level on distance and frequency, fading phenomena, band-width capabilities and realizable antenna gain. A short historical summary of beyond-horizon tropospheric transmission is also included. (*Same item as* 7.8–276, Aug. 1956, *MAB.*) *Subject Headings:* **1. Tropospheric propagation 2. Radio transmission.**—*Author's abstract.*

8J–72 551.594.7:551.510.52:621.396.029.6

†Campen, Charles F. and Cole, Allen E., **Tropospheric variations of refractive index at microwave frequencies.** *U. S. Air Force. Cambridge Research Center, Air Force Surveys in Geophysics,* No. 79, Oct. **1955.** 76 p. 46 figs., 4 tables, 44 refs., 13+19 eqs. **DWB, DLC**—The effect of gross variations in tropospheric refractive index on the accuracy of radio guidance systems for high altitude vehicles is discussed. Refractive index profiles prepared from radiosonde observations taken for three summer and three winter days at stations in different geographical locations in North America and representing various types of air masses are compared with a standard index of refraction curve derived from the ICAO Standard Atmosphere. Variations of the index at the ground, at 20 kilofeet, the average of the index from the ground to 25 kilofeet and the differences between these and the standard index are given. It was found that the index varied by 135 N units at the ground, by N units at 20 kilofeet, and that the average index from the ground to 25 kilofeet varied by 35 N units. When categorized by air mass type, by location, or by time intervals, variations within any of these categories were much smaller. Differences between the computed indices and the Standard Index ranged from +71 to −64 N units at the ground, from +17 to −4 N units at 20 kilofeet. The differences between the averages of the index from the ground to 25 kilofeet and the average of

the standard index ranged from +23 to −12 N units. Correlation of these average index data with surface index data was found to be very good. A correlation coefficient of 0.98 was obtained. For the scattergram a regression curve was drawn which showed a standard estimate of error of only 5 N units. Sample calculations of refraction errors were made which show use of the index data for correction of these errors. (*Same item as* 7.9–270, Sept. 1956, *MAB.*) *Subject Headings:* **1. Tropospheric refraction 2. Microwave propagation.**—*Authors' abstract.*

8J–73 551.594.7:621.396.11

†Carroll, T. J. and Ring, R. M. (*both, MIT, Lincoln Lab., Lexington, Mass.*), **Propagation of short radio waves in normally stratified troposphere.** *Institute of Radio Engineers, N. Y., Proceedings,* 43(10):1384–1390, Oct. **1955.** 3 figs., 24 refs., eqs. **DLC**—Experiments of the past decade give stronger fields well beyond the horizon than are calculated by the 4/3 airless earth approximation. Post-war work on the theory of the WKB approximation for wave propagation in slowly varying inhomogeneous media, and the peculiar results for eigenvalues of the bilinear refractive index profile offer valuable clues in the search for an oversight in conventional propagation theory. If the absolute value as well as the gradient of the refractive index at the earth's surface be specified, with a refractive index profile which tapers to vacuum at some arbitrarily large height, then allowed modes of the wave equation permit the field to be calculated within, just beyond, and well beyond the horizon, in agreement with many VHF and microwave experiments. Modes thus calculated are supported by ordinary coherent molecular scattering in normal air dielectric layer. At times, superrefraction and macroscopic turbulence are additional mechanisms for propagation deep into the shadow of the earth bulge. (*Same item as* 8.3–343, March 1957, *MAB.*) *Subject Headings:* **1. Short wave radio propagation 2. Refractive index.**—*Authors' abstract.*

8J–74 551.594.7:621.396

Carter, David, **Wide-angle radiation in pencil beam antennas.** *Journal of Applied Physics,* 26(6):645–652, June **1955.** 7 figs., 2 refs., eqs. **DLC**—Theoretical estimates are given here. Several methods and their simplification are demonstrated and discussed. The results presented graphically feature dependence on feed and dish parameters for wide-angle radiation. *Subject Headings:* **1. Microwave propagation 2. Observation techniques 3. Instruments.**—*W.N.*

8J–75 551.510.52:551.594.7:621.396

†Chisholm, J. H.; Portmann, P. A.; de Bettencourt, J. T. and Roche, J. F. (*all, M.I.T. Lincoln Lab., Lexington, Mass.*), **Investigations of angular scattering and multipath properties of tropospheric propagation of short radio waves beyond the horizon.** *Institute of Radio Engineers, N. Y., Proceedings,* 43(10):1317–1335, Oct. **1955.** 28 figs. (incl. photos), table, 23 foot-refs., eqs. **DLC**—Experiments designed to investigate the potential communications capacity of UHF and SHF tropospheric propagation beyond the radio horizon were conducted by the MIT Lincoln Laboratory on circuits from 161 to 188 mi in length along the coastal regions of the northeastern United States. Some of these tests were made in cooperation with the Bell Telephone Laboratories and the late E. H. Armstrong. A study of the following aspects of tropospheric propagation was considered necessary in order to gain a better understanding of the factors involved in design of communications systems: 1) the extent of useful communication bandwidths; 2) variation of UHF and SHF median signal levels over a full seasonal cycle; 3) the range and rates of fading; 4) the effective gain of highly directional antenna systems; 5) the effect of multipath propagation on modulated signals; 6) the polarization properties of scattered fields and 7) the angular dependence of scattered fields. Such experiments made from 1953 to 1955 have confirmed the utility of tropospheric circuits for wide-band communication systems and have provided information useful in the evaluation of tropospheric propagation mechanisms. *Subject Headings:* **1. Tropospheric propagation 2. Radio wave scattering 3. Radio communication.**—*Authors' abstract.*

8J–76 551.571.4:621.396.029

Collier, James S. (*57 Chapel Ave., Buffalo, N. Y.*), **Upper-air conditions for two-meter DX: temperature and water-vapor content soundings for some famous dates.** *QST,* West Hartford, Conn., 39(9):16–18, Sept. **1955.** 7 figs., ref. **DLC**—Synoptic weather maps give good clues to the conditions ideal for superrefraction of VHF (2 m) radio waves, but upper air soundings are the only sure indicators since they show existence and location of steep humidity gradients. An example of normal (nonsuperrefractive) temperature and humidity sounding, and 6 other soundings (Joliet, Albany, Pittsburgh, Toledo and Charleston, etc.) show conditions which give two-meter DX. The Charleston sounding indicates no humidity gradient (July 23, 1949) at a time when Toledo shows a marked gradient, indicating cause of nonreception at Charleston when conditions in the Northern States were good. (*Same item as* 7.9–189, Sept. 1956, *MAB.*) *Subject Headings:* **1. Tropospheric propagation 2. Humidity lapse rate 3. Two meter DX 4. Short wave radio propagation.**—*M.R.*

8J–77 551.594.7:621.396.029.6

†Crain, C. M. (*Electrical Engr. Res. Lab., Univ. of Texas*), **Survey of airborne microwave refractometer measurements.** *Institute of Radio Engineers, N. Y., Proceedings,* 43(10):1405–1411, Oct. **1955.** 12 figs., 13 refs. **DLC**—This paper presents a summary of airborne refractive index measurements which have been made at many locations in the U. S. both over land and off the east and west coasts, by several organizations. Included are the results of studies of the mean vertical structure of the index of refraction of the atmosphere as a function of such factors as location, season, horizontal distance, and time. Included also are the results of measurements of the fine detail variations of refractive index about its mean value at several locations for altitudes up to 20,000 ft mean sea level. (*Same item as* 8.3-345, March 1957, *MAB.*) *Subject Headings:* **1. Microwave refraction 2. Refractive index.**—*Author's abstract.*

8J–78 621.396

Deam, A. P. and Fannin, B. M., **Phase-difference variations in 9,350 megacycle radio signals arriving at spaced antennas.** *Institute of Radio Engineers, Proceedings,* 43(10):1402–1404, Oct. **1955.** 4 figs., ref. **DLC**—The phase difference between 9,350 megacycle-per-second radio signals received from a common transmitter at two horizontally spaced antennas was measured by the Electrical Engineering Research Lab. of the Univ. of Texas during March 1955. The transmitter was located on Cheyenne Mt. in Colorado and the site of the receiver was at Fort Carson, 3.5 mi distant. The elevation angle of the transmitter as seen from the receivers was 9°. This paper presents and discusses the results of these measurements. *Subject Heading:* **1. Radio transmission.** —*Authors' abstract.*

8J–79 538.566:621.396.11:551.594.7

Florman, Edwin F., **A measurement of the velocity of propagation of very-high-frequency radio waves at the surface of the earth.** *U. S. National Bureau of Standards, Journal of Research,* 54(6): 335–345, June **1955.** 12 figs., 4 tables, 24 refs., eqs. **DLC**—The velocity of propagation of electromagnetic waves was measured at the surface of the earth, using a radio-wave interferometer operating at a frequency of 172.8 Mc. The measured phase velocity, converted to velocity in vacuum, or the "free-space" value, was found to be 299795.1 ±31 km/sec. The uncertainty of ±3.1 km/sec includes a 95% confidence interval for the mean, plus an estimated limit to the systematic error of ±0.7 km/sec. Based on a 50% confidence interval (probable error of the mean), the uncertainty, including the estimated limit to the systematic error of ±0.7 km/sec, becomes ±1.4 km/sec. The accuracy with which the free-space velocity of radio waves could be measured was limited primarily by the accuracy to which the refractive index of air could be obtained from measured values of pressure, temperature and relative humidity. *Subject Headings:* **1. Electromagnetic wave propagation velocity 2. VHF radio propagation.**—*Author's abstract.*

8J–80 551.594.7:621.396 538.3

Furutsu, Koichi, **Propagation of electro-magnetic waves over a flat earth across a boundary separating different media and coastal refraction.** *Japan. Radio Research Laboratories, Tokyo, Journal,* 2(7):1–49, Jan. **1955.** 5 foot-refs., numerous eqs. **DWB**—The theory of propagation of radio wave over a flat homogeneous earth, transmitted across a boundary of discontinuity, such as a coast-line, is theoretically treated in three dimensional space. The derived formula for wave strength is exclusively expressed in the terms of the functions of the form: $U(z,n) = \int_z^\infty dx e^{-x^2} \int_{nx}^\infty e^{-v^2} dy$, which has a close connection with the function $G(a,b)$ introduced by Clemmow. The coastal refraction, the refraction of wave path at a coast line, is also treated, and the refraction angle is theoretically derived in a simple form for practical use. Further, the wave propagation across two or more boundaries of discontinuities is also discussed. (*Same item as* 7.5–256, May 1956, *MAB.*) *Subject Headings:* **1. Electromagnetic wave propagation 2. Radio wave propagation 3. Refraction of electromagnetic waves.**—*Author's abstract.*

8J–81 551.594.7

Gerks, I. H., **Factors affecting spacing of radio terminals in a UHF link.** *Institute of Radio Engineers, N. Y., Proceedings,* 43(10):1290–1297, Oct. **1955.** 12 figs., 7 refs., 18 eqs. **DLC**—Measurements made by the Central Radio Propagation Laboratory and others have established the feasibility of producing UHF fields at long distances which are sufficiently strong and consistent to be usable for communication purposes. This paper assembles the results of several investigators of the field strength-distance relationship and shows that these results are in reasonable agreement in a range of about 75 to 250 mi. Statistical variations from the median due to fading are discussed. Graphical means are developed to facilitate the determination of the signal-to-noise ratio at the receiver for various ranges of distance, antenna gain, frequency, transmitter power, bandwidth, and receiver noise figure. Diversity systems are explored briefly. Estimates are made of the

effect of the medium upon the antenna gain and the maximum bandwidth. *Subject Heading:* **1. Ultrashort wave propagation.**—*Author's abstract.*

8J–82 551.594.7

Gordon, William E., **Radio scattering in the troposphere.** *Institute of Radio Engineers, N. Y., Proceedings*, 43(1):23–28, Jan. **1955.** 8 figs., 11 refs., 19 eqs. **DWB**—The theory of radio scattering in the troposphere is modified in the light of recent observations of the fluctuations in refractive index. The theory is applied to the communication problem and yields some characteristics which are peculiar to the scattering mechanism. One characteristic imposes a limit on the maximum size of an antenna which yields its full theoretical gain. This characteristic is deduced from the prediction of diversity distance. Height gain is also deduced from diversity distance. Other characteristics are derived pertinent to the communication problem, including fading rates and frequency bandwidth of the scattering mechanism. (*Same item as* 7.5–257, May 1956, *MAB.*) *Subject Headings:* **1. Radio wave scattering 2. Troposphere.**—*Author's abstract.*

8J–83 551.510.535:621.396.11

*Gough, M. W., **Some features of VHF tropospheric propagation.** *Institution of Electrical Engineers, London, Proceedings*, Pt. B, 102(1):43–58, Jan. **1955.** 24 figs., 6 tables, 20 refs. Condensed version in: *Institution of Electrical Engineers, London, Journal*, New Series, 1(1):34–36, Jan. **1955.** 6 figs. **DLC**—Widespread VHF continuous signal-strength measurements made in tropical and Mediterranean regions over the last four years have exemplified and thrown into relief many of the well-known mechanisms of tropospheric propagation. Although these mechanisms are broadly familiar to many engineers and physicists, the practical magnitudes, as exemplified throughout the paper, are perhaps less widely appreciated despite their great importance to the communication engineers. It is the purpose of the paper to present and analyze new VHF data from the sources indicated, so as to show (a) that observed VHF signal patterns are consistent with tropospheric structures known commonly to occur, and (b) that sufficient information is now available to enable the communication engineer to forecast to a useful accuracy the statistical behavior of projected VHF radio paths in certain parts of the world. (*Same item as* 6.8–147, Aug. 1955, *MAB.*) *Subject Headings:* **1. Tropospheric radio wave propagation 2. Ultrashort wave propagation data.**—*Author's abstract.*

8J–84 551.594.7

Gudmandsen, P., **Notes on statistical analyses with special reference to the distribution of fade durations.** *Akademiet for de Tekniske Videnskaber. Mikrobolge Laboratoriet, Copenhagen,* [*Report,*] P 1312/1507/1525, June 24, **1955.** 33 diagr., 4 tables.—Data obtained on sea-paths under varying weather conditions using 3.2, 6.4, and 17 cm wave lengths are analyzed and discussed here. Statistical consideration is given in particular to sampling procedures employed, found adequate in representing propagation conditions in terms of distribution of field strengths. Distribution of fade distribution was found very sensitive to sampling procedure, influence of which is governed by wavelength employed, perhaps type of path and weather encountered; recording method and strength, however, seems independent upon length of sampling interval. *Subject Heading:* **1. Radio fading distribution.**—*From author's abstract.*

8J–85 551.594.7:621.396

Hay, D. R., **Some measurements on VHF and UHF signals at ranges between 50 and 235 miles.** *Ottawa. Defence Research Telecommunications Establishment. Radio Physics Laboratory, Project Report*, 22-0-4, Jan. 6, **1955.** 24 p. 10 figs., tables, 7 refs.—Signal transmissions at 49, 91, 173 and 492 Mc/s have been recorded for 48 hour periods at ranges of 50, 89, 152, 199 and 234 mi. These signals were transmitted over rolling terrain between moderately low antennas. Information has been obtained from these records on the relative attenuation with distance and the rates of fading of the four frequencies. Records have been made also of thunderstorm signals at these frequencies. *Subject Headings:* **1. Radio transmission 2. Radio fading.**—*Author's abstract.*

8J–86 551.594.7:621.396

Herbstreit, J. W. and Thompson, M. C. (*both, Central Radio Propagation Lab., Nat. Bureau of Standards, Boulder, Colo.*), **Measurements of the phase of radio waves received over transmission paths with electric lengths varying as a result of atmospheric turbulence.** *Institute of Radio Engineers, N. Y., Proceedings*, 43(10):1391–1401, Oct. **1955.** 14 figs., table, 12 refs., eqs. **DLC**—A system for the measurement of the variations in electrical lengths of radio propagation paths is described. The observed path-length instabilities are considered to be caused by the same atmospheric turbulence responsible for the existence of very high frequency and ultra high frequency fields far beyond the radio horizon. Results obtained on 172.8 mc and 1,046 mc along 3½-, 10-, and 60-mi paths are reported. It is pointed out that measurements of this type provide a powerful

tool for the study of the size and intensity of the refractivity variations of the atmosphere giving rise to the observed phenomenon. *Subject Headings:* **1. Radio wave propagation 2. Turbulence effects.**—*Authors' abstract.*

8J–87 551.594.7:551.508.99

Hirao, Kunio and Maruyama, Hiroyuki, **Special instruments for observations and analysis of VHF fading.** *Japan. Radio Research Laboratories, Tokyo, Journal,* 2(8):207–216, April **1955.** 12 figs., 2 refs., 5 eqs. **DWB**—The autocorrelation analysis has been carried out for the examination of fading of VHF wave. For the sake of this analysis, the recording system which is linear in voltage in its recorded fluctuation and the relay computer for Δxy are both designed and constructed. A few examples of the results are introduced in the present paper. The necessary duration of observation and intervals of reading are also discussed in the present report in order to avoid misunderstanding about the statistical quantities of fading. (*Same item as* 7.5–258, May 1956, *MAB.*) *Subject Headings:* **1. Radio fading 2. Radio fading instruments.**—*Authors' abstract.*

8J–88 551.594.7:019.941

†Institute of Radio Engineers, N. Y., **Proceedings, Vol. 43, No. 11, Pt. 2, Nov. 1955, Index to abstracts and references 1946–1953.** 189 p. Author Index and Subject Index for each year, and List of Journals for years 1948–1953. **DLC**—Eight separate author indexes, 8 subject indexes and 6 journal indexes for the respective years are bound together in an excellently printed, 3 column to the page publication which, unfortunately, is almost illegible without a magnifying glass. The author indexes contain abbreviated titles and reference to abstracts. Subjects under which abstracts of interest to meteorologists may be found, include absorption; anemometer, hot wire; atmosphere; troposphere; ionosphere; microwaves; radar wave propagation; meteorology; atmospherics; aurora; cosmic radiation; meteors; geomagnetic storms; geomagnetism; astronomy and radio; refractive index, etc. (*Same item as* 7.11–60, Nov. 1956, *MAB.*) *Subject Headings:* **1. Abstract indexes 2. Radio wave propagation abstracts.**—*M.R.*

8J–89 551.594.7:621.396

Janes, H. B., **An analysis of within-the-hour fading in 100- to 1,000-Mc transmissions.** *U. S. National Bureau of Standards, Journal of Research,* 54(4):231–250, April **1955.** 23 figs., table, 4 refs. **DLC**—An analysis is made of the fading range of 100- to 1,000-Mc transmissions received both within and beyond the radio horizon. The measurements were made during Aug. 1952 over various Cheyenne Mountain Field Station paths and over the Cedar Rapids, Iowa–Quincy, Ill. path. Fading range is defined as the ratio in decibels of the signal levels exceeded 10 and 90% of an hour. For each of the four frequencies studied, the extent to which median fading range and median signal level depend on the angular distance and time of day is shown in the form of graphs and sample recordings. The data show that beyond the region where diffraction is considered to be the dominant mechanism, the signal level distributions closely resemble the Rayleigh distribution in both fading range and general shape. *Subject Headings:* **1. Radio fading 2. Diffraction of radio waves.**—*From author's abstract.*

8J–90 551.510.52:551.594.7

Janes, H. B. and Wells, P. I. (*both, Central Radio Propagation Lab., Nat. Bureau of Standards, Boulder, Colo.*). **Some tropospheric scatter propagation measurements near the radio horizon.** *Institute of Radio Engineers, N. Y., Proceedings,* 43(10):1336–1340, Oct. **1955.** 4 figs., 7 foot-refs., 2 eqs. **DLC**—Measurements of small variations in 100 mc field intensity within and just beyond the radio horizon are reported. The measured fields are assumed to be the resultant of two field components, one having a constant amplitude and the other being a rapidly-fading scattered component. The fading range of the resultant field intensity over a 10-minute period is used to determine K. Here, K is the ratio in decibels of the root-mean-square amplitude of the scattered component to the amplitude of the constant vector. Curves showing the measured median values of basic transmission loss, fading rate, and K plotted vs hour of the day are included for three of the Cheyenne Mountain transmission paths. Diurnal variation of these quantities is also discussed. The average basic transmission loss of the scattered component, L_{bas}, can be found if K and the resultant basic transmission loss, L_{bm}, are known. Median values of L_{bas} and L_{bm} are plotted vs the angular path distance, θ. Measurement of the correlation of the resultant field strengths received on two horizontally-spaced antennas within the radio horizon is reported. When the spacing was varied from ½ to 20 wavelengths and the correlation compared to other characteristics of the field, the correlation was found to be as much a function of L_{bas} and fading rate as it was of antenna spacing. *Subject Headings:* **1. Tropospheric propagation 2. Radio wave scattering 3. Radio fading.**—*Authors, abstract.*

8J–91 551.594.7:061.6(08)

Japan. Radio Research Laboratories, Tokyo, **Seventh Semi-Annual Meeting on Researches Conducted in the Laboratories.** Its *Journal*, 2(7):107–109, Jan. **1955.** Listing of papers presented [with English titles]. **DWB**—Lists 16 papers read on Oct. 26, and 33 on Oct. 27, 1954 on many aspects of ionospheric and tropospheric propagation. Meeting was held at the Hall of the Radio Research Laboratories, Tokyo. (*Same item as* 8.3–346, March 1957, *MAB.*) *Subject Headings:* **1. Radiowave propagation 2. Meteorological research 3. Symposia.**—*M.R.*

8J–92 551.594.7:621.396

Jones, R. F., **Abnormal radio propagation December 3, 1954.** *Meteorological Magazine*, London, 84(997):225–226, July **1955. DWB**—Abnormal propagation on 180.4 Mc/s over 147 mi in Eng. is discussed. On Dec. 3, 1954, the field strength was 100 times normal. This is attributed to very dry air as low as 2200 ft with inversion below. (*Same item as* 7.1–356, Jan. 1956, *MAB.*) *Subject Headings:* **1. Radio transmission ducts 2. England.**—*C.E.P.B.*

8J–93 551.594.7:621.396

Kirby, R. S.; Dougherty, H. T. and McQuate, P. L., **Obstacle gain measurements over Pikes Peak at 60 to 1046 Mc.** *Institute of Radio Engineers, N. Y., Proceedings*, 43(10):1467–1472, Oct., **1955.** 11 figs., 3 tables, 13 refs., eq. **DLC**—Radio transmission loss measurements made over four propagation paths approximately 100 mi in length show the effect of a large mountain obstacle on VHF and UHF ground-to-ground propagation. Recordings of transmission loss were obtained at four sites as a function of receiving antenna height and by mobile measurements along a route normal to the propagation path. Measurements for propagation directly over Pikes Peak exhibit the well defined lobing associated with four ray-path diffraction theory. Theoretical approximations based on the FRESNEL-KIRCHHOFF scalar knife-edge diffraction theory predicts values of transmission loss and lobe structures which are in good agreement with those observed. Measurements for propagation to the east and west of Pikes Peak are characterized by lower fields at all frequencies and large fading ranges. *Subject Headings:* **1. Radio transmission loss 2. Terrain effects on radio propagation 3. Radio wave diffraction 4. Pikes Peak, Colo.**—*Authors' abstract.*

8J–94 551.594.7:621.396

Kono, Tetsuo; Nishikori, Kiyoshi; Fukushima, Madoka; Ikeda, Masao and Yoshida, Noriaki, **Experimental studies on diffracted waves from a mountain at 3000 Mc/s.** *Japan. Radio Research Laboratories, Tokyo, Journal*, 2(8):163–180, April **1955.** 21 figs., 4 tables, 8 refs. **DWB**—Radio transmission experiments were made at the frequency of 3000 Mc/s over the 243 km path between Kawaguchi and Ryozen in Sept. and over the 166 km path between Kawaguchi and Izumi in Dec. 1954. Mt. Yamizo lies in the midway of these paths. Transmission loss and fading characteristics obtained in this experiment are much different from that of a VHF radio wave experiment over a mountain. In the first experiment, the median value of the field intensity agreed approximately with that calculated by FRESNEL's knife-edge diffraction theory, but in the second experiment it was about 10 db below the calculated value. (*Same item as* 7.5–259, May 1956, *MAB.*) *Subject Headings:* **1. Radio transmission ducts 2. Radio fading 3. Radio wave diffraction 4. Japan.**—*Authors' abstract.*

8J–95 551.594.7:621.396.029.6

Kurihara, Yoshitaka (*Radio Research Labs., Tokyo*), **Trans-horizon microwave propagation over hilly terrain.** *Institute of Radio Engineers, N. Y., Proceedings*, 43(10):1362–1368, Oct. **1955.** 13 figs., 3 tables, 3 foot-refs., eqs. **DLC**—By introducing three path parameters into the geometry of scattered signal transmission, the spherical earth formulas of W. E. GORDON were extended to the nonspherical earth case. This paper describes the result of analysis. The nonspherical earth formulas were applied to the prediction of the signal power and characteristics of tropospheric scattered fields on the hilly 93-mile path between Ithaca and Wethersfield-Springs, N. Y., and on the 119-mile path between Ithaca and Buffalo, N. Y. The transmission experiments over these two paths were conducted at Cornell Univ., at frequencies of 2780 mc and 9150 mc. The results of the experiments are presented together with the predictions in this paper. *Subject Headings:* **1. Microwave propagation 2. Radio transmission 3. New York.**—*Author's abstract.*

8J–96 621.396.2:551.594.7:016

†Laver, F. J. M., **Introduction to some technical factors affecting point-to-point radiocommunication systems.** *Institution of Electrical Engineers, London, Proceedings, Pt. B*, 102(6):733–743, Nov. **1955.** 8 figs., 100 refs., 11 eqs. **DLC**—An extensive review of literature on point-to-point radio transmission and factors affecting it. Noise, distortion, attenuation, signal strength, fading, interference, etc. are treated in separate sections. Ionospheric and tropospheric propagation factors are considered, for both long and short range, high and low frequency transmission. (*Same*

item as 7.3–40, March 1956, *MAB.*) *Subject Headings:* **1. Point-to-point radio propagation 2. Radio wave propagation bibliographies.**—*M.R.*

8J–97 551.594.7:621.396.11

Miya, Ken-ichi and Kanaya, Sumiwo (*both, Kokusai Denshin Denwa Co., Ltd.*), **Radio propagation prediction considering scattering wave on the earth's surface.** *Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere Research in Japan,* 9(1):1–15, March **1955.** 12 figs., 2 tables, 15 refs. **DWB-DLC**—Control-point method is usually employed in the prediction of the behavior of radiowave propagation in long-distance radio communication channels. For a particular channel, however, this method often gives results considerably discrepant with observation. With the intention of improving the percentage of successful prediction, this paper deals with the investigation of the method of applying the scattering waves on the earth's surface to the prediction of radio-wave propagation conditions. A new method called "control-line method" is proposed to determine the *MUF* with regard to the scattering waves from the land and from the earth's surface. The new and the old methods are applied to various radio communication channels and the theoretical and observed results are compared. It is found that for commercial short-wave bands below 20 Mc/s, only normal and land-scattered propagations can be taken into account for satisfactory prediction. Next, the method of calculating the *LUF* is investigated. Numerous examples show that the new *MUF* and *LUF* give prediction that hits fairly good to radio circuits between Europe and Japan. Finally, the method of the I.P.S. of Australia, which is aimed at correcting the errors of the prediction of propagation conditions, is discussed from the authors' point of view. *Subject Headings:* **1. Radio wave propagation computations 2. Scattering.**—*Authors' abstract.*

8J–98 551.594.7

Muchmore, R. B. and Wheelon, A. D., **Line-of-sight propagation phenomena—I. Ray treatment.** *Institute of Radio Engineers, N. Y., Proceedings,* 43(10):1437–1449, Oct. **1955.** 9 figs., 22 refs., 55 eqs. Also, Wheelon, A. D. and Muchmore, R. B., **Line-of-sight propagation phenomena.—II. Scattered components.** *Ibid.,* 43(10):1450–1458, Oct. **1955.** 10 figs., table, 19 refs., 55 eqs. Also, Wheelon, A. D., **Near-field corrections to line-of-sight propagation.** *Ibid.,* 43(10):1459–1466, Oct. **1955.** 3 figs., 9 refs., 53 eqs. **DLC**—In Pt. 1, the effect of variations in index of refraction on line-of-sight propagation of electromagnetic waves in the troposphere is investigated using a ray theory approach. Mean-square variations in phase delay and phase correlation between two paths are calculated. It is shown that these quantities are relatively insensitive to the form of space correlation function assumed for the index of refraction. The mean-square phase is proportional to $\overline{\Delta N^2 l_0}$ where l_0 is scale length and $\overline{\Delta N^2}$ the mean-square variation in index of refraction, whereas in beyond line-of-sight propagation the received power is proportional to $\overline{\Delta N^2}/l_0$. Variations in angle of arrival are also calculated and it is shown that here the assumed space correlation of index of refraction is critical in determining the angle of arrival characteristics. It is shown, however, that a certain portion of the angle-of-arrival spectrum is insensitive to the choice. In Pt. 2, the foregoing investigation of line-of-sight propagation through a turbulent atmosphere is continued and enlarged. Generalizations of the ray calculation to include scattering contributions by off-axis blobs are given. It is found that the previous expressions for tms phase errors are substantially maintained. The dependence of these fluctuations on receiving antenna beamwidth is reduced. These techniques are then applied to estimate phase scintillation for transmission through a rainstorm. Meteorological data are used to relate such errors to rainfall intensity and to infer scintillation frequency spectra. Numerical values for these effects are given for representative atmospheric conditions. In the last article, the line of sight propagation of electromagnetic waves in a turbulent medium is considered. The field equation describing propagation through a region characterized by random dielectric fluctuations is first developed. Solutions of this equation which represents the scattered field are derived with ordinary perturbation theory. These solutions are next used to calculate the rms phase error for an arbitrary path in the troposphere. This approach includes both a three-dimensional and near-field description for the multipath, scattered amplitudes; thereby overcoming the limitations of previous treatments. The phase correlation between signals received on two parallel transmission paths is derived last to illustrate the role of overlapping antennae beams. *Subject Headings:* **1. Radio wave scattering theory 2. Troposphere.**—*From authors' abstracts.*

8J–99 551.594.7:621.396.11

Northover, Francis H., **Long distance VHF fields, Pt. 1, Partial reflection from a standard atmosphere.** *Canadian Journal of Physics,* Ottawa, 33(5):241–256, May **1955.** 13 refs., numerous eqs. Also his: **Pt. 2, Refractivity profiles containing "sharp layers."** *Ibid.,* 33(6):316–346, June **1955.** fig., 2 tables, 13 refs., numerous eqs. Also his: **Pt. 3, The case of two elevated layers.** *Ibid.,* p. 347–349. eqs. **DWB**—Reliable propagation of VHF waves and microwaves from high power transmitters to distances of several hundred miles beyond optical range has been demonstrated by an ever increasing number of experiments during the last ten years. The fields which have been

observed have consistently been many times greater than the field strengths predicted by the "effective radius" theory. The present paper will be published in three parts. In Pt. I the theory that the phenomenon can be explained solely in terms of "partial internal reflection" from elementary layers of a dielectric distribution where the rate of decrease of $(\mu-1)$ with height is everywhere continuous and of the same order of magnitude as in a "standard" atmosphere is carefully examined and found to be untenable. In Pt. II, the case where the distribution contains "sharp layers" (i.e., local regions where $(\mu-1)$ changes relatively rapidly with height) is examined and it is found that these could cause the phenomenon. However, in view of the other characteristics of the observed field, it is concluded that the effect in question is probably more usually due to scattering of the electromagnetic waves from atmospheric turbulence.

In Pt. 2, the general solution developed in Pt. 1 is applied to the case in which the refractivity profile contains sharp layers (i.e. local regions where μ and $d\mu/dh$ change very rapidly compared with their rate of variation in a "standard" type atmosphere). It is found that such layers, when well developed, can cause distant fields of the order of magnitude of those which have been observed, but present experimental evidence seems to indicate that scattering from atmospheric turbulence is usually the important factor. An attempt is made to work out a physical interpretation of the field-formation below the elevated layer.

In Pt. 3, the general theory developed in Pt. 1 and in the beginning of Pt. 2 is applied to derive an equation for the eigenvalues of the propagation for the case of two sharp elevated layers. This equation is very briefly discussed and some special cases noted. *Subject Headings:* **1. Radio transmission ducts 2. Ultrashort wave propagation.**—*Author's abstract.*

8J–100 551.594.7:551.510.52

†Norton, Kenneth A. and Wiesner, Jerome B., **The scatter propagation issue.** *Institute of Radio Engineers, N. Y., Proceedings,* 43(10):1174, Oct. **1955. DLC**—This large issue of the **Proceedings** is devoted to about 35 papers on various aspects of tropospheric or ionospheric propagation of short radio waves beyond the horizon. The introduction by Norton and Wiesner explains the phenomenon in terms of two contrasting theories, one that irregular "blobs" in the troposphere or cosmic dust clouds in the ionosphere are responsible for this anomalous propagation, the other that regular discontinuities could accomplish the same results (inversions or gradients producing refraction). (Papers are abstracted separately and contents found in *Pt. III,* 7(3):398, *MAB.*) (*Same item as* 7.5–1, May 1956, *MAB.*) *Subject Heading:* **1. Tropospheric propagation.**—*M.R.*

8J–101 551.594.7:621.396

†Norton, K. A.; Rice, P. L.; Janes, H. B. and Barsis, A. P. (*all, Central Radio Propagation Lab., Nat. Bureau of Standards, Boulder, Colo.*), **Rate of fading in propagation through a turbulent atmosphere.** *Institute of Radio Engineers, N. Y., Proceedings,* 43(10):1341–1353, Oct. **1955.** 13 figs., table, 22 refs., numerous eqs. **DLC**—Fading rate is defined to be the number of times per minute that the envelope of the received field crosses its median level with a positive slope. This definition of fading rate is equally useful for ionospheric or tropospheric propagation studies. Furthermore, it may be used with equal facility on short transmission paths where the ground wave component of the received field predominates and on the longer transmission paths where the scattered component of the received field predominates. It is shown that this definition of fading rate provides a quantity which is numerically related to the parameters of the propagation medium under certain conditions which are normally satisfied in either ionospheric or tropospheric propagation studies. The pertinent parameters of the propagation medium in beyond-the-horizon transmission are the location and shape of the scattering volume and the turbulent and drift velocities of the scatterers. An extensive discussion is given of the shape of the tropospheric scattering volume for beyond-the-horizon transmission. An analysis is then given of some fading rate data obtained in the National Bureau of Standards tropospheric propagation program in the 92 to 1046 mc range of frequencies on transmission paths, 70, 97, 226, and 394 mi in length. Finally, an analysis is given for within-the-horizon propagation. In this case it is advantageous to define fading rate as the number of times per minute that the phase of the received field crosses its median level with a positive slope. (*Same item as* 8.5–339, May 1957, *MAB.*) *Subject Headings:* **1. Radio wave propagation 2. Radio fading 3. Turbulence effects.**—*Authors' abstract.*

8J–102 551.594.7:621.396

†Norton, K. A.; Rice, P. L. and Vogler, L. E. (*all, Central Radio Propagation Lab., Nat. Bureau of Standards, Boulder, Colo.*), **Use of angular distance in estimating transmission loss and fading range for propagation through a turbulent atmosphere over irregular terrain.** *Institute of Radio Engineers, N. Y., Proceedings,* 43(10):1488–1526, Oct. **1955.** 40 figs., 56 foot-refs., 71 eqs. **DLC**—A discussion is given of the transmission loss expected in free space with various types of antennas, followed by a description of theoretical prediction curves for the transmission loss expected in tropospheric propagation on overland paths. The Bremmer-van der Pol theory of diffraction and the Booker-Gordon

and Weisskopf-Villars theories of tropospheric forward scattering are then developed in terms of angular distance as a parameter. Angular distance is the angle in the great circle plane between the radio horizon rays from the transmitting and receiving antennas. It is shown that this parameter replaces, to a first order of approximation, both the transmission path length and the antenna heights. Angular distance is shown to be useful for predicting the short term within-the-hour fading range as well as the median transmission loss. Illustrations are presented of the theoretical dependence of transmission loss on the angular distance, transmission path length, antenna height, radio frequency, and a parameter ΔN which is a measure of the vertical gradient of atmospheric refractive index. Most of the long-term variations of the scattered field intensities with time, as well as the climatological variations, are attributed to changes in ΔN. A new theory of obstacle gain is developed, and it is shown that this is particularly useful for explaining some of the unusually strong fields which have been observed just beyond the horizon in overland propagation. The diffraction and scattering theories are compared with extensive data on radio transmission loss involving 136,000 hourly median values recorded over 122 propagation paths at frequencies between 66 and 1046 megacycles. Estimates of the Booker-Gordon scattering parameter $[\overline{(\Delta n/n)^2}/l_0]$ and of the Weisskopf-Villars scattering parameter $\{[\overline{(dn/dh)^2}]-[\overline{(dn/dh)}]^2\}$, determined from our median radio data and normalized to a height of one kilometer above the surface, are considered to be correlated with the gradient of refractivity, ΔN. The ratio data indicate that the magnitude of the scattering cross section decreases in inverse proportion to the radio frequency in the range we have studied. This provides strong evidence in favor of the Weisskopf-Villars tropospheric forward scattering theory presented elsewhere in this issue of the **Proceedings.** Theoretical curves of the average value of the path antenna gain to be expected in tropospheric forward scatter propagation are presented as a function of the angular distance, the asymmetry factor, and the free space gains of the transmitting and receiving antennas. (*Same item as* 8.5–340, May 1957, *MAB.*) *Subject Headings:* **1. Radio wave propagation 2. Radio fading 3. Radio transmission 4. Turbulence effects.**—*Authors' abstract.*

8J–103 551.594.7:621.396

Norton, K. A.; Vogler, L. E.; Mansfield, W. V. and Short, P. J., **The probability distribution of the amplitude of a constant vector plus a Raleigh-distributed vector.** *Institute of Radio Engineers, N. Y., Proceedings,* 43(10):1354–1361, Oct. **1955.** 4 figs., 2 tables, 10 refs., 41 eqs. **DLC**—The discussion is accompanied by formulas, tables and graphs. Distribution of: 1) amplitude of a constant vector and of 2) of the Rayleigh-distributed vector along with physical requirements involved are treated. The paper ends with a discussion on two other random vectors as encountered in tropospheric propagation studies. *Subject Headings:* **1. Scatter propagation theories 2. Tropospheric propagation.**—*W.N.*

8J–104 551.594.7:621.396

†Poeverlein, Hermann, **Field strength near the skip distance.** *U. S. Air Force. Cambridge Research Center, AFCRC-TR-54-104,* Jan. **1955.** 13 p. 3 figs., 20 refs., 26 eqs. **DWB** (M94 P745f)—The field strength in an interval of a few hundred km beyond the skip distance is derived from theoretic-optical considerations as proportional to $(x-x_s+\Delta x_c)^{-\frac{1}{4}}$ where $x-x_s$ is the distance from the skip distance. The small correction term Δx_c provides the correct skip distance value of the field strength. The focusing which occurs at the skip distance itself increases the field strength under certain regular conditions to about eight times the unfocused free propagation field strength. At short skip distances, however, this focusing becomes weaker and another much broader field strength maximum appears at a distance from the transmitter approximately proportional to the layer thickness. *Subject Heading:* **1. Radio field strength.**—*Author's abstract.*

8J–105 551.594.7:621.396

Rogers, T. F., **VHF field strength far beyond the radio horizon.** *Institute of Radio Engineers, N. Y., Proceedings,* 43(5):623, May **1955.** fig. **DLC**—Brief report on experimental transmission of 1.4 m waves over a 420 statute mile flight path over the North Atlantic Ocean eastward from Boston, Mass. It is shown that 1.4 m field strength decreases less rapidly than MEGAW's observations with 10 cm waves. This may indicate a dependency upon wavelengths so far as attenuation is concerned, however, with the reservation that weather conditions and seasons differed in these transmissions. *Subject Headings:* **1. VHF field strength 2. Radio transmission 3. North Atlantic.**—*W.N.*

8J–106 551.510.535:551.594.7

Silleni, Stelio, **Su alcuni fattori geofisici nelle radiocommunicazioni.** [Some geophysical facts in radiocommunication.] *Annali di Geofisica,* Rome, 8(1):135–148. Jan. **1955.** 4 figs., 14 refs., eqs. Italian and English summaries p. 146–147. **DLC**—A review of ionospheric and tropospheric

propagation theory and the latest empirical data on effects of time of day, temperature, humidity and magnetic disturbances which affect radio propagation in the various wave bands (including short wave radio telephone circuits). *Subject Headings:* **1. Ionospheric radio wave propagation 2. Tropospheric propagation.**—*M.R.*

8J–107 551.594.7:551.551

Silverman, Richard A. (*N. Y. Univ.*), **Some remarks on scattering from eddies.** *Institute of Radio Engineers, N. Y., Proceedings,* 43(10):1253–1254, Oct. **1955.** 8 foot-refs., 2 eqs. **DLC**—The Gaussian character of electromagnetic radiation scattered from turbulent atmosphere fluctuations is shown to follow from the Central Limit Theorem, even when the scattering is from only one macro-eddy and there is coupling between eddy motions of different sizes. It is suggested that including the effects of eddy coupling may increase the calculated average scattered power enough to give agreement with experiment. *Subject Headings:* **1. Radio wave scattering 2. Turbulence effects 3. Eddies.**—*Author's abstract.*

8J–108 551.510:621.396.11

Stack-Forsyth, E. F., **An experimental study of the propagation of 10 cm radio waves over a short non-optical sea path.** *Institution of Electrical Engineers, London, Proceedings, Sec. B,* 102(2): 231–236, March **1955.** 8 figs., table, 5 refs., 5 eqs. **DWB**—Tests of 10 cm radio propagation over sea paths up to 21.1 mi (1.14 times optical horizon) were made near Durban in April–Aug. 1953. Temperature and humidity up to 600 ft were obtained by balloon or kite. A duct of average depth 120 ft was present for a large proportion of the time, especially night and early morning with a secondary maximum at midday; it was caused by a high lapse of vapor pressure. *Subject Headings:* **1. Radio transmission ducts 2. Durban, South Africa.**—*C.E.P.B.*

8J–109 551.594.7:551.551

Staras, Harold (*Engineering Products Div., RCA, Camden, N. J.*), **Forward scattering of radio waves by anisotropic turbulence.** *Institute of Radio Engineers, N. Y., Proceedings,* 43(10):1374–1380, Oct. **1955.** 12 figs., 9 foot-refs., numerous eqs. **DLC**—This paper extends the theory of tropospheric scatter by deriving the appropriate formulas for the important radio system parameters under the assumption that the turbulence is anisotropic; i.e., that the scale of turbulence in the horizontal dimension is different from the scale of turbulence in the vertical dimension. The frequency dependence of the scattered radiation is the same for anisotropic large-scale turbulence as for isotropic. Furthermore, those radio systems parameters which depend only on the rate of decrease of scattered energy with elevation angle (such as the vertical correlation function and height gain) remain unchanged under the assumption of anisotropy while those parameters which depend on the energy coming out of the great circle plane (such as the horizontal correlation function) can be influenced quite substantially by anisotropy. Several other parameters such as the longitudinal correlation function, bandwidth of the medium and effective antenna gain may also be influenced by anisotropy but generally to a lesser extent. A comparison is made between our theory and some recent NBS data—indicating that anisotropy does exist. *Subject Headings:* **1. Radio wave scattering 2. Anisotropic turbulence.**—*Author's abstract.*

8J–110 550.384:551.594.7:551.510.52

Tao, Kazuhiko, **On the relationship between the hourly variation of field strength and the structure of the lower atmosphere.** *Japan. Radio Research Laboratories, Tokyo, Journal,* 2(8):181–191, April **1955.** 13 figs., table, 10 refs. **DWB**—It is clear that the relationship between the hourly variation of field strength and the distribution of the refractive index in the lower atmosphere is ascertained by the actual data from captive balloon observations, i.e., the high level of field strength corresponds to the abnormal distribution of the refractive index. Moreover, it is clear that the abnormal distribution of the refractive index can be explained from the viewpoint of synoptic meteorology. (*Same item as* 7.5–260, May 1956, *MAB.*) *Subject Headings:* **1. Geomagnetic variations 2. Tropospheric refraction 3. Radio field strength fluctuations.**—*Author's abstract.*

8J–111 551.594.7:621.396:016

†Texas. Univ. Electrical Engineering Research Lab., **Bibliography of Reports, Memoranda, Technical Publications, Papers and Theses, 1945–1955.** Contract Nonr 375(01), Report No. 75, March 31, 1955. 45 p.—The material is arranged as follows: (1) Reports to the sponsoring agencies: U. S. Navy, U. S. Air Force, U. S. Army, U. S. Nat. Bur. of Standards, and industrial organizations; (2) Technical publications; (3) Papers by staff members of the University and (4) theses. *Subject Heading:* **1. Tropospheric propagation bibliographies.**—*W.N.*

8J–112 551.510.52:551.594.7

Tidd, W. H. (*Bell Telephone Labs., N. Y.*), **Demonstration of bandwidth capabilities of beyond-horizon tropospheric radio propagation.** *Institute of Radio Engineers, N. Y., Proceedings,* 43(10):

1297–1299, Oct. 1955. 8 figs. (incl. photos). DLC—Tropospheric radio transmission beyond the horizon is characterized by rapid and selective fading, which suggests a possible limitation on the useful bandwidth. The tests discussed were made to explore the bandwidth capabilities of this medium. Bell Telephone Laboratories conducted these tests in cooperation with the M.I.T. Lincoln Laboratory on a 188-mi path at 5050 mc with a power of 300 w and 28-ft paraboloidal antennas. Two types of tests were made. First a 12-voice-channel multiplex system for intermodulation crosstalk. IF band was 1.3 mc. Then television tests were made with a deviation of ±4 mc and IF bandwidth of 30 mc. No significant impairment in system quality could be attributed to distortion in transmission medium in either test. (*Same item as* 8.5–342, May 1957, *MAB.*) *Subject Headings:* **1. Tropospheric propagation beyond the horizon 2. Radio transmission.**—*Author's abstract.*

8J–113 551.594.7(521.2):621.396.11

Tohsha, M., **On the superrefraction of microwave in Kanto District.** *Journal of Meteorological Research*, Tokyo, 7(7):446–454, Oct. 1955. 12 figs., 3 tables, 8 refs., 7 eqs. In Japanese; English summary p. 446. DWB—Radar echoes accompanying superrefraction which is anomalous propagation of radar wave were observed before sunset on Aug. 5, 1954 in Kanto district. Whether the phenomenon depends on the *k*-type refraction in which the effective radius of the earth increases, or on the duct type in which the distribution of refractive index N or M decreases with height in the surface layer of the atmosphere, is discussed. From the judgment of observational data at Tateno and Tsukuba, it is found that *k*-type anomalous propagation had not occurred. It is considered that the phenomenon of superrefraction occurred as the duct type, from the minute analysis of aerological sounding at Tateno. Also, the formation of duct was discussed synoptically, using the data observed in the networks of meteorological stations in Kanto district, and the condition that the two air flows were mixed in the surface layer was found to be necessary for the formation. The 4000 Mc receiving and its recording of one way transmission between Mitaka and Tsukuba were operated by the Electric Communication Laboratory, and the attenuation of duct layer was observed in the period of the anomalous echoes, the value of which attained to about 10 db. On the other hand, a condition that air flows were not mixed was investigated, in which case such superrefraction as the above-mentioned was not found. (*Same item as* 8.5–346, May 1957, *MAB.*) *Subject Headings:* **1. Superrefraction 2. Radar propagation 3. Kanto District, Japan.**—*Author's abstract.*

8J–114 551.594.7:551.510.52

Trolese, L. G. (*Smythe Res. Associates, S. Diego, Calif.*), **Characteristics of tropospheric scattered fields.** *Institute of Radio Engineers, N. Y., Proceedings*, 43(10):1300–1305, Oct. 1955. 12 figs., table, 6 refs., eqs. DLC—Experimental results obtained with transmissions at wavelengths of 3.2, 9.3, and 24 cms over a 46.3-mi path are presented. With low terminal heights the scattered field was dominant on this path. Tests with a narrow beam antenna indicate that the scattered field arrives at the receiver spread over an appreciable angle. This angle is some five to seven times as large as the Booker-Gordon theory predicts on the assumption that the scale of turbulence is large compared to the wavelength. Loss in ability to receive power in proportion to antenna gain was encountered for antennas with aperture diameters greater than about 20 wavelengths. This loss occurs for aperture sizes considerably smaller than the Booker-Gordon theory predicts. The speed of fading of the scattered field signal increases almost linearly with frequency. This agrees fairly well with the concept (due to RATCLIFFE and applied to tropospheric scattering by BOOKER and GORDON) that fading is due to beating between various scattered field components whose frequencies differ by a fractional Doppler shift due to motion of the scatterers. The speed of fading always increases, during the day, with time of day and does not correlate with mean upper wind speed. This increase with time of day is probably connected with the repetitive diurnal meteorological cycle prevalent in Arizona. (*Same item as* 8.3–349, March 1957, *MAB.*) *Subject Headings:* **1. Tropospheric scattering 2. Radio transmission 3. Radio fading.**—*Author's abstract.*

8J–115 551.510.52:621.396.11

Tropospheric scatter propagation: 200-mile transmission on frequencies in the UHF band. *Wireless World*, London, 61(6):253–254, June 1955. fig., 2 refs. DLC—The turbulent troposphere is visualized as made up of a number of spherical blobs in which the dielectric constant differs from that of the medium as a whole. These scatter the energy, mainly forward, and are usable by highly directive beam aerials up to 200 mi. Practical applications are described. *Subject Headings:* **1. Tropospheric propagation 2. UHF radio propagation.**—*C.E.P.B.*

8J–116 551.582.3(261,264,265/66) 551.594.7

*U. S. Office of Naval Operations, **U. S. Navy Marine Climatic Atlas of the World, Vol. 1, North Atlantic Ocean.** Its *NAVAER* 50-1C-528, Nov. 1, 1955. xvii p., 275 charts (in color), 31 refs. Also Vol. 2, **North Pacific Ocean.** *Ibid.*, 50-1C-529, July 1, 1956. xvii p., 275 charts (in color).

both 50×34 cm. **DWB** (M82.3 U585m)—Each of these carefully compiled atlases contains among many other charts useful for naval air and sea operations, four charts covering the "Modified Refractive Index" or "B" Index for the respective seasons (Dec.–Mar. to Sept.–Nov.). The data are presented in frequency distribution paste-ups for the 60 or more upper air stations in all parts of the Atlantic or Pacific (including Weather Ships). The values presented are for 25% and 75% of all B-Values (quartets) for each of 5 levels (surface, 950, 900, 850 and 800 mb). The data are derived from 0300Z observation for varying lengths of record (1946–1955). Charts of frequency of inversions and of annual temperature and humidity are also included. For abstract on Vol. 1, *see* 8.5–81, May 1957, *MAB*. *Subject Headings:* **1. Marine atlases 2. Modified refractive index charts 3. Inversion frequency charts 4. Atlantic Ocean 5. Pacific Ocean.**—*M.R.*

8J–117 551.594.7:551.551

†Villars, F. and Weisskopf, V. F., **On the scattering of radio waves by turbulent fluctuations of the atmosphere.** *Institute of Radio Engineers, N. Y., Proceedings*, 43(10):1232–1239, Oct. **1955.** 5 figs., 2 tables, 20 refs., numerous eqs. **DLC**—This paper presents a theoretical analysis of the mechanism that enables transmission of VHF-signals over distances of the order of 10^3 km. It is found that turbulent mixing, operating at the lower edge of the E layer (h =80–90 km) produces fluctuations in electron density of sufficient intensity to account for the observed signals. The basic assumptions are the existence of a sufficiently strong gradient of electron density ($dN/dh \gtrsim 10^3$ cm^{-3}/km) and a reasonable level of turbulent activity. *Subject Headings:* **1. Radio wave scattering 2. Turbulent fluctuations.**—*Authors' abstract.*

8J–118 551.594.7:551.551

Waterman, Alan T., Jr., **Radio power received via tropospheric scattering.** Stanford Univ. Applied Electronics Laboratory, Contract DA 36-039-Sc-63189, Contract Nonr 225(10), Technical Report, No. 461-1, July 18, **1955.** 7 p. 9 refs., eqs. (U. S. ASTIA, AD 66502).—UHF and SHF beyond-horizon propagation as a function of atmospheric turbulence is treated theoretically here. Integration of the scattered power involved can be performed exactly as is demonstrated. *Subject Headings:* **1. Tropospheric propagation beyond the horizon 2. Atmospheric turbulence.**—*W.N.*

8J–119 551.594.7 621.396.11

†Wheelon, A. D. (*Ramo-Wooldridge Corp., Los Angeles, Calif.*), **Note on scatter propagation with a modified exponential correlation.** *Institute of Radio Engineers, N. Y., Proceedings*, 43(10):1381–1383, Oct. **1955.** 14 refs., numerous eqs. **DLC**—A phenomenological exponential space correlation of dielectric fluctuations is normally used to predict scatter field strengths beyond the horizon. This paper introduces a modified exponential model which includes effects of the smallest blob cutoff in the turbulent spectrum and rectifies the correlation's cusp at the origin. It is found that the present agreement of troposphere scatter experiments with the exponential function does not depend on this cusp. It is suggested that frequency-dependent tropospheric fields recently measured below 25 cm may indicate the influence of the correlation's fine structure. The same model is then applied to the ionosphere, where the extended range VHF scatter wavelengths just straddle the smallest blob size (~3 m) in the E layer. The turbulence fine structure is most important for this propagation and gives a qualitative explanation of the curious dualism in frequency scaling laws observed at opposite ends of the VHF band. Satisfactory variation of signal strength with scattering angle is also predicted by this model. It is shown that scatter measurements can provide valuable estimates of the atmosphere's fine structure at various heights. (*Same item as* 8.5–344, May 1957, *MAB.*) *Subject Headings:* **1. Radio wave scattering 2. Ultrashort wave propagation.**—*Author's abstract.*

8J-120 551.594.7:551.510.52

Yamada, Ryozo, **On the radio wave propagation in a stratified atmosphere.** *Physical Society of Japan, Journal*, 10(1):71–77, Jan. **1955.** table, 6 figs., 7 refs., numerous eqs. **DWB**—In the present paper certain approximate methods concerning operators H of Hilbert space which can be expressed in the form $H=T^*T$ are developed. Some theorems are formulated with remarks and examples. They give a method of obtaining upper and lower bounds of the value of the solution, at each preassigned point, of a boundary value problem. As a numerical example we consider the following Poisson equation, $-\Delta u=1$ in D, $u=0$ on C, where D denotes the square domain in the xy-plane with vertices at (1, −1), (1,1), (−1,1), (−1, −1) and C is the boundary of this square. Upper and lower bounds of the value of the solution u at the origin are calculated. The result of the second approximation is $0.2939 \leqq u(0.0) \leqq 0.2953$. In order to show that the results are applicable to many problems, several differential operators familiar in mathematical physics, for instance, Laplace's differential operators with different boundary conditions are reduced to the form T^*T. *Subject Headings:* **1. Tropospheric propagation 2. Weber's function.**—*Author's abstract.*

1956

8J–121 551.594.7:621.396:551.588.2

Barsis, A. P. and MacGavin, R. E., **Report on comparative 100 Mc measurements for three transmitting antenna heights.** *Institute of Radio Engineers, Transactions*, Vol. AP-4, No. 2:168–174, April **1956.** 17 figs., 6 tables, 7 refs. **DBS**—This report evaluates measurements taken during Aug. 1952 at a frequency of 100 Mc as transmitted from three transmitting sites at elevations ranging from 6220 ft to 14,110 ft above msl. Six receiving sites were used, ranging in distance from approximately 50 mi to 620 mi from the transmitter sites. Results are presented in terms of hourly medians of recorded field intensity and their distributions, as well as the over-all median values and deviations derived from these distributions. *Subject Headings:* **1. Microwave propagation 2. Topographic influences.**—*Authors' abstract.*

8J–122 551.594.7:621.396.9(26)

Brocks, Karl, **Der Brechungsindexgradient für elektromagnetische Wellen (Cm-bis M-Band) in der maritimen Grenzschicht der Atmosphäre.** [The gradient of refractive index for electromagnetic waves (cm- to m-band) in the maritime boundary layer of the atmosphere.] *Deutsche Hydrographische Zeitschrift*, 8(5):186–194, **1955.** 4 figs., 3 tables, 9 refs., 18 eqs. German, English and French summaries p. 186–187. Also: Brocks, Karl and Hasse, Lutz, **Pt. 2** [Summary, diagrams and tables]. *Ibid.*, 9(5):217–221, **1956.** 3 fold plates, 2 tables, 5 refs., 8 eqs. German, English and French summaries p. 217. **DWB**—The vertical gradient of the modified refractive index is correlated with the air-water temperature difference and the vertical stratification of water vapor. These correlations enable the mean vertical gradient of refractive index in the duct in the lower decameter above the surface to be calculated. Tables and diagrams are given for practical application, with values for summer and winter at Weather Ship "D" as an example. (*Same item as* 7.10–305, Oct. 1956, *MAB.*) In Pt. 2, further aids are given for computing the refractive index above the sea. These are: vapor pressure (mb) from dry and wet bulb temperatures, saturation vapor pressure and relative humidity from vapor pressure and dry bulb temperature, and $N=(n-1)10^6$ (n = refractive index) from dry bulb and wet bulb or water temperature (salinity 35‰). A short method is described for computing curves of refractive index from air temperature, water content, wind velocity, sea temperature and salinity. *Subject Headings:* **1. Refraction of electromagnetic waves 2. Refractive index computations 3. Oceanic ducts.**—*C.E.P.B.*

8J–123 551.594.7:621.396(09)

Carroll, Thomas J. (*M.I.T. Lincoln Lab., Lexington*), **Marconi's last paper "On the propagation of microwaves over considerable distances."** *Institute of Radio Engineers, N. Y., Proceedings*, 44(8):1056–1057, Aug. **1956. DLC**—Also translation (in same *Proceedings*, p. 1056) by R. M. Fans into English of the original Italian: Marconi, G., **Sulla propagazione di micro-onde a notevole distanza** (originally published 1933, and included in the **Scritti di Guglielmo Marconi,** pub. Rome 1941. The two important last papers published by Marconi in 1932 and 1933 did not attract much attention in the scientific world, but now it is evident that the great inventor was well ahead of his time in this respect, just as he was regarding trans-Atlantic propagation of long radio waves. A translation of the 13 sentence paper, which was published in 1933, reveals that MARCONI did not believe high frequency radio waves were limited to the optical horizon, and that results of tests made from Santa Margherita Ligure and a receiver on a yacht (Elettra) along the coast of Tirreno (Aug. 2–6, 1933) at 60 cm (500 mc) indicated that good reception was to be had at 150 km, or 5 times the distance to the optical horizon. The year before (July and Aug. 1932) he had obtained poorer reception—only twice the optical distance. Signals could be detected at 258 km or 8 times the optical distance, and across high hills to boot. The author intended to publish more complete results, but his health was poor and he died soon after (1937). *Subject Headings:* **1. History of radio propagation 2. Abnormal propagation of microwaves 3. Radio propagation beyond the horizon 4. Translations. I. Marconi, G.**—*M.R.*

8J–124 551.594.7

Clarke, Robert F. (*Meteorologist, Army Electronic Proving Ground, Fort Huachuca, Ariz.*), **The relation of physical conditions in the atmosphere to microwave propagation.** (**1956.**) 29 p. 7 figs., 6 refs., 6 eqs. **DWB** (M94.7 C599r)—A method of forecasting microwave trapping or superrefraction in "ducts" at low levels in the troposphere, was developed by the author at Fort Huachuca, Ariz. since assignment there in Aug. 1955. The method involves forecasting the longest wave length that will be trapped on the following morning and this depends on forecasts of humidity, temperature, pressure and wind. In desert areas humidity varies slightly. Observational and research program as well as equipment and theoretical basis for forecasting is treated. No forecasts have been verified as yet, although daily forecasts have been issued since Sept. 15, 1955. *Subject Headings:* **1. Microwave superrefraction forecasts 2. Tropospheric propagation 3. Fort Huachuca, Ariz.**—*M.R.*

8J–125 551.594.7:551.576

†Cunningham, Robert; Plank, Vernon G. and Campen, Charles M., **Cloud refractive index studies.** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers*, No. 51, Oct. **1956.** 105 p. 65 figs. (some fold., some photos), 29 refs., 5 tables. **DLC, DWB**—An analysis of data obtained by various methods in and around cumulus clouds is presented in detail in order to obtain a rough idea of the variations in refractive index between clouds and free air or within clouds or cloudy regions. Radiosonde data, cloud photographs, and aircraft refractometer and cloud physics measurements near Tucson, Ariz.; Ft. Banks, Mass.; Denver, Colo.; Yuma, Ariz.; Rantoul, Ill., and Mt. Clements, Mich. in June and July 1955 with a B-29 equipped with a U. of Texas model refractometer are reproduced. Soundings, cross-sections, statistical graphs, cloud photos, refractive index traces, etc. are reproduced *in extenso* and the methods, equipment and discussion of each day's flight treated in text. More knowledge of convective cells in clouds is needed. *Subject Headings:* **1. Refractive index in clouds 2. Convective cloud structure 3. Airborne refractometer data.** —*M.R.*

8J–126 551.594.7:621.396:551.588.2

Furutsu, Koichi, **Field strength in the vicinity of the line of sight in diffraction by a spherical surface.** *Japan. Radio Research Laboratories, Journal*, 3(11):55–76, Jan. **1956.** 12 figs., eqs. **DWB**—The convergence of the series of the ordinary Watson formula used for diffraction by a spherical surface becomes very bad in the vicinity of the line of sight, and the formula is scarcely applicable for practical use in this domain. The problem of convergence of this kind can be solved by suitable choice of the integration path. According to this method the formula is divided into two parts, one of which has the same expression as obtained in the case of a flat earth or obtained by the method of geometrical optics or Kirchoff's approximation. The other part is expressed in the integral form which is rather adapted to the numerical calculation. The latter thus explicitly expresses the effect of diffraction or correction to the former. The method is applied to several cases, and the results are displayed in figures in a useful range of parameters. Some of these figures are especially convenient for calculation of field strength in diffraction by a spherical mountain or any mountain having sufficiently large radius of curvature as compared with the wave length. *Subject Headings:* **1. Tropospheric propagation 2. Topographic influences.**—*Author's abstract.*

8J–127 551.594.7:551.511.13

Gerhardt, J. R.; Crain, C. M. and Chapman, H. (*all, Univ. of Texas*), **Microwave refractive index fluctuations associated with convective activity in the atmosphere.** *American Meteorological Society, Bulletin*, 37(6):251–262, June **1956.** 10 figs., 8 refs., eq. **DWB.** Also Gerhardt, J. R. and Crain, C. M., **Recent measurements of tropospheric microwave refractive index fluctuations (Shorter version).** *Weather Radar Conference, 5th, Asbury Park, Sept. 1955, Proceedings.* pub. **1956.** p. 43–44. **DWB**—This study deals with the results of a series of refractive index measurements made while flying at various constant levels in the lower troposphere in and around Colorado and Florida. The refractometers used were sufficiently sensitive "to observe refractive index or equivalent moisture content variations having frequencies up to 100 cycles per second and amplitudes as small as 0.01 N-unit." The response, operation, installation of the refractometer and the measurement program are described and recordings of measurements under different atmospheric conditions are given. The observed pattern of refractive index variations was found to be associated with the moisture changes in air masses "in which convective heat transfer from the ground is contributing to the formation of rising warm, moist air thermals and cumulus clouds." An indirect use of the refractometer is its value in the analysis of these atmospheric processes either contributing to or producing tropospheric mixing. *Subject Headings:* **1. Refractive index 2. Refractometers 3. Convective activity.**—*I.L.D.*

8J–128 551.594.7:621.396

Gerks, I. H. and Svien, A. J., **Wave propagation over a 350 mile path at 960 Mc.** *Institute of Radio Engineers, N. Y., Convention Record*, Pt. 1:3–8, **1956.** 10 figs., 4 refs. **DLC**—The object of this paper is to present some of the propagation results observed at 960 Mc over a 350 mi path. The path on which the greater portion of the data was obtained extends from Lamar, Mo. to the Collins Engineering Building at Cedar Rapids. Some results of tests made at intermediate points are also included. *Subject Heading:* **1. Radio propagation beyond the horizon.**—*From authors' abstract.*

8J–129 551.594.7

Gossard, E. E. and Anderson, L. J., **The effect of superrefractive layers on 50–5000 mc nonoptical fields.** *U. S. Navy Electronics Laboratory, San Diego, Calif., Research Report*, No. 684, April 3, **1956.** p. 175–178. 8 figs., 4 refs. **DWB.** Also issued in *Institute of Radio Engineers, Transactions*, Vol. AP-4, No. 2:175–178, April **1956. DBS**—Radio propagation data taken over 82 naut. mi of

water between San Diego and San Pedro, Calif. on 52, 100, 547 and 5000 Mc are analyzed and compared with the atmospheric structure. Attenuation coefficients calculated from the Furry model agree quite well with observational results at 100 Mc but not for lower or higher frequencies. Conclusion is that for a given height of the top of the superrefractive layer there is an optimum frequency for which attenuation is a minimum. *Subject Headings:* **1. Superrefractive layers 2. Tropospheric propagation 3. UHF and VHF radio propagation 4. Southern California.**—*M.R.*

8J–130 551.594.7:681.14:621.38

Grønlund, M. and Lund, C. O., **An electronic computer for statistical analysis of radio propagation data.** *Akademiet for de Tekniske Videnskaber, Copenhagen, Mikrobölgelaboratoriet,* [*Report*] P 1992, Sept. 13, **1956.**—The equipment in use at the laboratory is described in some detail along with future improvements. Pen recordings of the field strength are transferred into a five-digit binary code (by a manually operated curve converter) and stored as perforated punched teletype tape, from which the statistical analysis is made by electronic equipment permitting reading of data at 1000 numbers per sec. Distribution curves, single set as well as for a diversity system, are handled. *Subject Headings:* **1. Radio wave propagation data analysis 2. Electronic computers.**—*From authors' abstract.*

8J–131 522.9:551.571.4:621.396.826

Hooper, A. H. and Taylor, A. P., **Radio refraction in the free atmosphere.** *Great Britain. Meteorological Research Committee, M.R. Papers,* 1021, Dec. 31, **1956.** 6 p. 2 figs., 4 tables, ref., 5 eqs. Mimeo. **DWB**—The theory of refraction, and the refractive index structure of the atmosphere, are set out. The refraction correction of radar heights is calculated for I.C.A.N. moist atmosphere. Further corrections are considered for I.C.A.N. dry atmosphere, and for low level European and sub-tropical moisture discontinuities. *Subject Heading:* **1. Radar refraction corrections.**—*C.E.P.B.*

8J–132 551.594.7:621.396.11:629.13

Hopkins, R. U. F.; Smyth, J. B. and Trolese, L. G., **The effect of superrefraction on the high-altitude coverage of ground-based radar.** *U. S. Navy Electronics Laboratory, San Diego, Calif., NEL Report* 741, Dec. 12, **1956.** 19 p. 12 figs. (incl. photos), 11 refs. **DWB** (M055 U585r, No. 741)—The effects of a standard atmosphere and of ducts and elevated layers on propagation (reflection, refraction and ducts) of 218, 418 and 1089 Mc coverage at distances up to 150 mi and heights up to 60,000 ft are discussed, and nomograms are presented showing characteristics of propagation. The details of the experimental procedures used to test the effects of index of refraction anomalies on high angle propagation, using high flying jet planes, between Jan. 1953 and Jun. 1955 over the Pacific Ocean west of Los Angeles are set forth. It was found that both by theoretical and experimental means, the distribution of field strength at angles 1° above the horizon is not appreciably affected by inversions or other atmospheric inhomogeneities at 218, 418 or 1089 Mc. A series of diagrams show index of refracting profiles and variations of field strength with distance for vertically and for horizontally polarized radiation at frequencies of 218, 418 and 1089 Mc for distances up to 300 mi for altitudes of 28,000–39,000 ft. The presence of strong temperature inversions or ducts at low altitude results in loss of energy in region from the horizon to 1° or so above the horizon. Normally there are large "lobes" of field strength intensity but these may be broken up into fine "spikes" if low altitude index of refraction changes are large. *Subject Headings:* **1. Superrefraction effects on radar 2. Airplane propagation observations 3. High angle tropospheric propagation.**—*M.R.*

8J–133 551.594.7:621.396(02)

Kamen, Ira and Doundoulakis, George (*both, General Bronze Corp., Electronic Div., N. Y.*), **Scatter propagation, theory and practice.** Indianapolis, Howard W. Sams & Co., Oct. **1956.** 197 p. 141 figs. (incl. tables), eqs. **DLC**—This book, written by design engineers, deals with design problems of tropospheric equipment. The general theory on scatter propagation of radio waves is given and discussed in relation to the ionosphere and troposphere. Several meteorological aspects influencing reliability, range and maintenance of tropospheric equipment for transhorizontal, local and/or worldwide radio communication are discussed. Tabulated and graphical presentation as well as excellent photographs enhance the value of the work. *Subject Headings:* **1. Radio wave scattering theory 2. Radio instrumentation 3. Textbooks.**—*W.N.*

8J–134 551.594.7:621.396:551.588.2

Kirby, R. S. and Caps, F. M. (*both, U. S. Nat. Bureau of Standards, Central Radio Prop. Lab., Boulder, Colo.*), **Correlation in VHF propagation over irregular terrain.** *Institute of Radio Engineers, Transactions,* Vol. AP-4, No. 1:77–85, Jan. **1956.** 10 figs., 6 refs. **DBS**—A study has been made of the correlation in transmission loss observed over irregular terrain paths. Simultaneous mobile

measurements were made of two pairs of VHF broadcasting stations in the Wash., D. C.–Baltimore, Md. area. The correlations coefficients derived from sample sets of transmission loss data indicate that when reception is from opposite directions, no significant correlation is evident, and when the paths of propagation are the same even though the frequencies are separated considerably, the correlation appears to be significantly high. *Subject Headings:* **1. Microwave propagation 2. Topographic influences 3. Washington, D. C. 4. Baltimore, Md.**—*Authors' abstract.*

8J–135 551.594.7:621.396.029

Klinker, L. (*Kühlungsborn Met. Obs., East Germany*), **Meteorológiai befolyások a rövid periódusú elhalkulások kialakulására az ultrarövid hullámú távolsági forgalomban.** [Meteorological influences on the production of fadings of short duration in VHF long-distance communication.] *Időjárás*, Budapest, 60(4):212–221, July/Aug. 1956. 7 figs., 12 refs. Russian and English summaries p. 212. German version p. V–X. **DLC**—By observations of wave propagation made during special synoptic situations, the author has been led to the assumption that two peculiar types of VHF fadings are produced by atmospheric dispersion and by partial reflections on free inversion surfaces. *Subject Heading:* **1. Short wave radio fading.**—*Author's abstract.*

8J–136 551.594.7:621.396

Lacy, R. E. and Sharp, C. E., **Radar-type propagation survey experiments for communication systems.** *Institute of Radio Engineers, N. Y., Convention Record*, Pt. 1:20–27, 1956. 9 figs. **DLC**—A technique for conducting rapid UHF and microwave propagation surveys is described. Experiments have been made using the terrain backscatter patterns of a radar PPI scope. The results are discussed and illustrated with photographs. *Subject Heading:* **1. Radar propagation.**—*From authors' abstract.*

8J–137 551.594.7:621.396

Maenhout, A., **Gunstige voortplantingsvoorwaarden voor zeer korte golven.** [Favorable propagation conditions for very short waves.] *Hemel en Dampkring*, The Hague, 54(2):40–41, Feb. 1956. fig. **DWB, DLC**—The propagation of very short wave radiation as a function of atmospheric refraction which is influenced by atmospheric conditions is outlined and the unusually favorable propagation of very short waves on Jan. 6, 1956 is explained by the magnitude of the refractive index at Uccle which increased the propagation of the 3-meter band by 32%. *Subject Headings:* **1. Short wave radio propagation 2. Refractive index 3. Uccle, Belgium.**—*I.L.D.*

8J–138 551.594.7

*Noyer, Vance E., **Preliminary synoptic analyses of the atmospheric refractive index climatology of Alaska and the Western United States coastal waters.** *Weather Radar Conference, 5th, Asbury Park, N. J., Sept. 1955, Proceedings*, pub. 1956. p. 45–61. 12 figs. **DWB**—The synoptic climatological approach is used in the study of the microwave refractive index conditions in Alaska, the Aleutians and Northwest Canada. Radiosonde data from a fairly dense network of stations are used to obtain daily maps showing the regional distribution of the vertical gradient of refractive index (1000–850 mb) and of the absolute value of this parameter at 850 mb. A few of the maps for Sept. 1953 which were prepared in this study are reproduced and discussed. Another study of the horizontal and vertical variations of the low level refractive index profiles off the California coast was made on the basis of airborne refractometer measurements made between Aug. 4 and Oct. 29, 1954. *Subject Headings:* **1. Refractive index maps 2. Synoptic refractive index studies 3. Refractive index profiles 4. Alaska.**—*M.R.*

8J–139 551.510.535:621.396.11

Pineo, V. C. (*Natl. Bur. of Standards, Wash., D. C.*), **Heights of ionospheric and tropospheric scattering determined from VHF pulse measurements.** *U. S. Nat. Bureau of Standards, NBS Report*, No. 3570, Feb. 10, 1956. (*See also* 8J–140.) 7 p. 5 figs., 3 refs. **DWB** (M94.7 P651h)—By measuring the relative delay in round trip pulses over a 624 km path, between two 50 Mc pulse transmitting and receiving stations at Round Hill, Mass. and Sterling, Va. during Dec. 1954 and Oct. 1955, the heights of the ionospheric layers and the tropospheric layers which are responsible for the 2 modes of scattering, were determined. Some diurnal variation (93 km at 1000 and 1700 h, and 89 km at 12–14 h for ionosphere in Dec. and 87–97 km in Oct.), tropospheric heights averaged 39 km, methods, sources of error and magnitudes are discussed. Results obtained by direct and by comparative methods are shown on scatter diagrams. Results are valid only for these latitudes. *Subject Headings:* **1. Ionospheric scattering layer height 2. Tropospheric scattering layer height.**—*M.R.*

8J–140 551.510.535:621.396.11

Pineo, V. C. (*Natl. Bureau of Standards, Wash., D. C.*), **Oblique-incidence measurements of the heights at which ionospheric scattering of VHF radio waves occurs.** *Journal of Geophysical Research*,

Wash., D. C., 61(2, Pt. 1):165–169, June **1956.** 3 figs., 2 refs., eq. **DLC**—Indirect measurements of the heights at which ionospheric scattering of VHF waves occurs, using the technique of measuring the differences in the times of arrival of tropospheric and ionospheric pulses received over an 810 km oblique-incidence path, were made by the National Bureau of Standards in Nov. 1952 and in Jan. 1953. These measurements show approximate heights of 86 km and 70 km, respectively, for the night-time hours and the midday hours. The accuracy of the heights obtained in this way are subject to uncertainties about the actual tropospheric delays. (*Same item as* 8.4–164, April 1957, *MAB.*) *Subject Headings:* **1. Ionospheric scattering 2. Ultrashort wave propagation.**—*Author's abstract.*

8J–141 551.594.7:016

†*Plank, Vernon G., **A meteorological study of radar angels.** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers*, No. 52, July **1956.** 117 p. 29 figs., 4 tables, 113 refs., 24 eqs. **DWB, DLC**—Three different types of angels are recognized: 1) layer angels; 2) localized source angels and 3) erratic angels. Their nature, size, meteorological conditions favoring each type, other sources (insects and birds or dust), refractive index inhomogeneities, the history of angels of each type, and a thorough bibliography are presented in this monograph. A tremendous amount of theoretical, graphical and tabular data are analyzed and incorporated in the text. Work is based on radar soundings at Round Hill, Mass. in 1951–53 and on work of others in this field. Of all the possible sources, refractive index inhomogeneities are found to be the most common. Activity is the greatest with high temperature, moisture content and light winds, awd with pronounced convective activity. (*Same item as* 8.6–28, June 1957, *MAB.*) *Subject Headings:* **1. Refractive index inhomogeneities 2. Angels 3. Radar angels 4. Angel bibliographies.**—*M.R.*

8J–142 551.594.7(08)

Potts, D. H.; Rempel, R. W. and Goss, R. N., **A summary of the symposium on normal mode theory, 5–7 July 1955.** *U. S. Navy Electronics Laboratory, San Diego, Research Report: NEL Report*, No. 718, Oct. 9, **1956.** 26 p. 8 figs., 13 refs., eqs. **DWB**—The symposium, held at the Navy Electronics Laboratory, San Diego, Calif., on July 5, 6 and 7, 1955, under the chairmanship of S. A. SCHELKUNOFF of Bell Telephone Laboratories, and jointly sponsored by the Office of Naval Research, Navy Engineering Laboratory, and Ryan Aeronautical Company, consisted of a round table discussion of theoretical knowledge of wave propagation through stratified media, methods of solution of problems, and outstanding problems yet to be solved. No formal papers were presented. The subjects discussed were ray theory, Huggens' principle, normal modes, Sommerfield surface wave, and propagation beyond the horizon. Appended is a paper by FRIEDMAN on **Normal modes in tropospheric propagation.** *Subject Headings:* **1. Tropospheric propagation symposia. I. Friedman, Bernard.**—*Partly from summary and M.R.*

8J–143 551.594.7

Schachenmeier, Richard, **Einige Forschungsarbeiten über die Ausbreitung ultrakurzer Wellen.** [Investigations on the propagation of ultra short waves.] *Akademie der Wissenschaften, Berlin, Wissenschaftliche Annalen*, 5(7):589–603, July **1956.** 10 figs., 10 refs., 8 foot-refs., 14 eqs. **DWB, DLC**—The author reviews several investigations in which it was attempted to measure and calculate the tropospheric conditions influencing the reception intensity of ultrashort radiation in the case of relatively short distances and low antennae heights. *Subject Heading:* **1. Ultrashort wave propagation.**—*I.L.D.*

8J–144 551.594.7:551.551.22

Silverman, Richard A. (*Inst. of Math. Sciences, N. Y. Univ.*), **Turbulent mixing theory applied to radio scattering.** *Journal of Applied Physics*, 27(7):699–705, July **1956.** 2 tables, 18 refs., eqs. **DLC**—OBUKHOFF's statistical theory of turbulent mixing is proposed as a replacement for the heuristic theories of GALLET and VILLARS-WEISSKOPF, and is applied to the problem of the scattering of radio waves by refractive index fluctuations. In the case of ionospheric scattering, order-of-magnitude agreement with the observed scattered power is obtained if the refractive index fluctuations are attributed to electron density fluctuations produced by turbulent mixing in the lower edge of the *E* layer. In the case of tropospheric scattering, it appears that order-of-magnitude agreement with the observed scattered power can be obtained, except during the summer months, by attributing the refractive index fluctuations to temperature fluctuations. During the summer months and at low scattering heights, humidity and its fluctuations are expected to play a prominent role. Experimental and theoretical evidence is cited in favor of perennial fractional-degree temperature fluctuations in the troposphere. A comparison of the Obukhoff, Villars-Weisskopf, and Booker-Gordon models in given, and it is found that the Obukhoff model predicts the most scattered power. *Subject Headings:* **1. Radio wave scattering 2. Turbulence effects.**—*Author's abstract.*

8J–145 551.594.7

Staras, Harold, **Scattering of electromagnetic energy in randomly inhomogeneous atmosphere.** *Journal of Applied Physics*, 23(10):1152–1156, Oct. **1956.** 15 eqs. **DLC**—It is demonstrated that the integral expressions as used by PEKERIS, BOOKER and GORDON are not appropriate to use as a space correlation function of refractive index. Here is introduced a time correlation instead which permits direct measurement of the time correlation function and formal evaluation of the time average scattered power, which is shown to depend but little on any particular model of turbulence. However in its large-scale turbulence condition it is affected greatly by the time correlation chosen or by the assumption that scattering is a result of randomly located spheres. *Subject Heading:* **1. Refractive index inhomogeneities.**—*From author's abstract.*

8J–146 551.594.7:621.396.11:629.13

Starkey, B. J., **Some aircraft measurements of beyond-the-horizon propagation phenomena at 91.3 Mc/s.** *Farnborough, England. Royal Aircraft Establishment, Technical Note*, No: RAD.638, March **1956.** 4 p. 4 figs., 7 refs. Mimeo. **GB-MO.** Also in: *Institution of Electrical Engineers, Proceedings, Pt. B*, 103(12):761–763, Nov. **1956.** 4 figs., 8 refs., eq. **DLC**—Field strength measurements on an aircraft at 10,000 ft 150–430 mi from source (Wrotham) showed an initial decrease slower than expected from diffraction theory, maxima at about 250 and 300 mi, deep and regular fades beyond 350 mi and a rapid drop to noise level at 420 mi. Horizon was about 175 mi. The extended range is attributed to specular reflection from a tropopause discontinuity of refractive index at 38,000 ft shown by radiosonde at Lerwick. The fluctuations are explained by interference between various rays. (*Same item as* 8.1–396, Jan. 1957, *MAB.*) *Subject Headings:* **1. Radio propagation beyond the horizon 2. Airplane propagation observations.**—*C.E.P.B.*

8J–147 551.594.7:551.578.46

Suzuki, Michiya and Hasegawa, Taro (*both, Yamagata Univ. Faculty of Engineering*), **Vertical distribution of radio meteorological M-curve for near the snow-covered terrain.** *Seppyo* (*Snōw and Ice*), Tokyo, 18(2):48–55, Aug. **1956.** 8 figs., 7 refs. In Japanese; English summary p. 48. **DWB**—The variation of the equivalent reflection coefficient (*Pe*) is one of the most important factors which determine the properties of K-Type Fading at microwave propagation over snow-covered terrain. And *Pe*'s physical meaning is somewhat complicated by the reason that it contains many factors (surface deposited snow's dielectric properties, radio meteorology, etc.). So we observed *Pe*'s daily variation at the model propagation test (at very short distance 100 m, 4000 Mc/s) and annexed the radio meteorological condition's measurements. This paper shows the method of this experiment and the analytic results on the radio meteorological M-curve (M-profile lies on the very low layer near upon the model test's reflection point). The vertical profiles of measured atmospheric temperature and M-curve are represented in Fig. 4 and ΔM (M-inversion) in Fig. 6 respectively. In general, the variation of ΔM is smaller than over the land and sea, especially at night time. So it is found that the dielectric properties of deposited snow at reflection surface had probably a pretty large influence on the variation of *Pe*. *Subject Headings:* **1. Microwave propagation 2. Snow cover 3. Terrain effects on microwave propagation.**—*Authors' abstract.*

8J–148 551.594.7:621.396:551.524.4

*Tao, Kazuhiko, **Some consideration for the field strength of ultra short waves at night.** *Japan. Radio Research Laboratories, Journal*, 3(11):77–99, Jan. **1956.** 15 figs., 15 refs. **DWB**—This analytical study is based on two years of transmission experiments conducted at the Radio Research Laboratories of Japan. Frequencies at 150 and 60 Mc were used over the 125 km path from Kokubunjii to Hiraiso, the latter located in diffraction region. It is shown that super-high field strength at night is a function of a tropospheric M-layer formed by abnormal water vapor distribution and associated with temperature inversion. This formation is discussed in terms of synoptic meteorology. It is suggested that prediction of hourly median field strength of USW is greatly facilitated by these analyses. *Subject Headings:* **1. Tropospheric propagation 2. Temperature inversions 3. Synoptic studies 4. Kokubunjii, Japan 5. Hiraiso, Japan.**—*W.N.*

8J–149 551.594.7:551.510.52

Troitskiĭ, V. N., **Otrazhenie ul'trakorotkikh voln ot sloistykh neodnorodnosteĭ troposfery.** [Ultrashort wave reflection from stratified inhomogeneities of the troposphere.] *Radiotekhnika*, Moscow, 11(1):7–16, Jan. **1956.** English trans. issued by Special Libraries Association Translation Center as its No. R-975. 20 p. Available John Crerar Library, Chicago. **DLC**—A theoretical treatment of reflection of oblique incident ultrashort radio waves falling on stratified discontinuities in the troposphere and the determination of the coefficient of refraction from various forms of superrefractive layers. The basic formula used is

$$\Delta e.10^6 = \frac{155}{T^2} P\left(-\Delta T + 4800\frac{\Delta e}{P}\right)$$

where P=pressure in mb, T=absolute temperature, e=absolute humidity. *Subject Heading:* **1. Tropospheric refraction theory.**—*M.R.*

8J–150 551.594.7

U. S. National Bureau of Standards, Boulder Laboratories, **First annual report, July 1, 1954 to June 30, 1955.** *U. S. Nat. Bureau of Standards, NBS Report,* No. 3566, (1956?). 125 p. **DWB**—The work of the Boulder Laboratories under the direction of F. W. Brown, consists of work in Cryogenic Engineering, Radio Propagation Physics, Radio Propagation Engineering and Radio Standards. The work of the Central Radio Propagation Laboratory is discussed on p. 31–98 of this report. The work considered embraces the field of predictions for North Atlantic and Pacific radio transmission, studies of solar-terrestrial relationships, physical processes of the upper atmosphere and radio propagation characteristics of the ionosphere, airglow triangulation, construction of airglow photometers, sferics recording and propagation, ionospheric winds and tides, cosmic radio noise, Arctic propagation (auroral zone), microwave absorption, ionospheric scatter, sporadic E, radioastronomy, terrain effects on propagation, tropospheric propagation measurements on Cheyenne Mountain and the Pacific Coast (Point Mugu) with airborne refractometers. Personnel, publications, work with other institutions and for IGY are included in report. *Subject Headings:* **1. Boulder (Colo.) Laboratory reports 2. Ionospheric radio wave propagation 3. Tropospheric propagation research 4. Boulder, Colo.**—*M.R.*

8J–151 551.594.7

World Meteorological Organization, **International Geophysical Year, 1957–1958, Meteorological Programme: general survey.** Its *WMO (Publication)*, No. 55. IGY. 1, **1956.** 111 p. forms. **DWB, DLC**—In a systematic review of the IGY, its purposes, programs of investigations and observations, networks, communications, codes, data collection, etc., a section (p. 14–15) is devoted to the observation program for tropospheric propagation. The resolutions made in 1952, 1954 and 1956 by ICSU Joint Commission on Radio meteorology, URSI, etc., the work to be carried out by National Committees during IGY, and other details, are outlined. The program calls for publication of radiosonde data up to 700 mb. Captive balloon observations, refractometer measurements of refractive index, humidity gradient measurements near cloud tops, study of humidity discontinuities and of diurnal, seasonal, geographic and cloud type variations in relative humidity gradient. (*Same item as* 8.10–34, Oct. 1957, *MAB.*) *Subject Headings:* **1. Tropospheric propagation observation program 2. IGY tropospheric propagation program 3. Refractometer observations 4. Humidity gradient variation.**—*M.R.*

1957

8J–152 551.594.7

Arvola, William A. (*U. S. Navy Electron. Lab., San Diego, Calif.*), **Refractive index profiles and associated synoptic patterns.** *American Meteorological Society, Bulletin,* 38(4):212–220, April **1957.** 12 figs., eqs. Also reprinted as *U. S. Navy Electronics Laboratory, Research Report, NEL Report,* No. 793, May 23, 1957. **DWB**—A study is made of meteorological conditions associated with synoptic patterns passing over the Middle West leading to super-refractive index profiles. The signal strength for a 71.75 mc TV-link in Illinois is related to the refractive index profiles. *Subject Headings:* **1. Refractive index profiles 2. Radio field strength.**—*Author's abstract.*

8J–153 551.594.7:551.521.3

Bean, B. R. and Abbott, R. (*both, Nat. Bur. of Stand., Boulder, Colo.*), **Oxygen and water vapor absorption of radio waves in the atmosphere.** *Geofisica Pura e Applicata,* Rome, 37:127–144, **1957.** 12 figs., 4 tables, 22 refs., 5 eqs. **DLC**—Calculated values of the gaseous atmospheric absorption are presented for frequency range 100 to 50,000 Mc at elevations above ground up to at least 130,000 ft, for average conditions during Feb. and Aug. at Bismarck, N. D. and Washington, D. C. Total radio path absorptions are presented for tropospheric forward scatter communication links for distances of 100, 300 and 1000 mi. A correlation of total path absorption with the surface value of absolute humidity is developed, thus providing estimates of the range of absorption values in different geographic areas. Maps of average absolute humidity for the world are presented. Previous work on rain absorption is then combined with the present study to provide estimates of the radio power loss due to absorption expected to be exceeded 1% of the time. *Subject Headings:* **1. Absorption of radio waves 2. Radio communication maps 3. World humidity maps.**—*From authors' abstract.*

8J–154 551.594.7

Bean, B. R. and Cahoon, B. A., **Use of surface weather observation to predict the total atmospheric bending of radio rays at small elevation angles.** *U. S. National Bureau of Standards, NBS Report,* No. 5082, June 10, **1957.** 6 p. 4 figs., table, 7 refs., 4 eqs. **DWB**—The possible effects of marked departures from smoothed refractive index profiles (either space or time smoothed)

on accuracy of predictions of total bending in paths of low angle beams were evaluated by calculations using data from eleven selected radiosonde stations in Alaska, U. S. and at Truk for 1951–1952. Various regional, seasonal and inversion types of variations are illustrated by means of profiles, histograms and scatter diagrams. It is shown that surface values of refractive index can be used for predicting total bending even for elevation angles of arrival or departure as small as 1 milliradian. *Subject Headings:* **1. Refractive index profiles 2. Inversions 3. Forecasting radio-weather conditions.**—*M.R.*

8J–155 551.571:551.594.7

Bean, B. R. and Cahoon, B. A. (*Natl. Bureau of Stand., Boulder, Colo.*), **A note on the climatic variation of absolute humidity.** *American Meteorological Society, Bulletin,* 38(7):395–398, Sept. **1957.** 5 figs., table, 8 refs. **DWB**—Maps of the variation of absolute humidity over the U. S. are presented for the values exceeded 1, 50 and 99% of the time during the months of Feb. and Aug. Cumulative distributions of absolute humidity are presented for nine climatologically diverse locations for the four seasons of the year. In addition, regression equations have been derived to enable one to estimate the values of absolute humidity exceeded 1 and 99% of the time at any location for which average values are available. Graphs show cumulative distributions for Tatoosh, Bismarck, Ely and Miami. The charts are intended for use in radio-refractive index or propagation studies. *Subject Headings:* **1. Absolute humidity variations 2. Refractive index studies 3. Absolute humidity charts 4. United States.**—*Partly authors' abstract.*

8J–156 551.594.7

Bean, B. R. and Horn, J. D., **On the world wide variations of radio refractivity as derived from standard weather observations.** *U. S. National Bureau of Standards, NBS Report,* 5083, June 5, **1957.** 7 p. 5 figs., 2 tables, 10 refs. **DWB**—Based on data for 250 stations, most of which have 30 yrs of record, as published in the U. S. Weather Bureau's **Climatic data for the world,** world-wide maps of the monthly mean of the surface value of the radio refractivity, N_s, are presented for the months of Feb. and Aug. A map is also given of the maximum range of monthly mean values of N_s. Annual cycles of N_s are presented for each of six major climatic types. It is estimated that geographic variations of monthly mean field strengths may be as much as 25 db for identically equipped tropospheric forward scatter systems and that annual cycles may be as large as 15 db, due solely to correlation with the variation in surface refractivity. *Subject Headings:* **1. Radio communication maps 2. Ground refractivity world maps.**—*Authors' abstract.*

8J–157 551.594.7

Booker, H. G. and Gordon, W. E. (*both, Cornell Univ.*), **Role of stratospheric scattering in radio communication.** *Institute of Radio Engineers, N. Y., Proceedings,* 45(9):1223–1227, Sept. **1957.** 2 figs., table, 9 refs. **DLC**—On the mixing-in-gradient hypothesis of incoherent scattering of radio waves in a dry atmosphere, the intensity of the irregularities in dielectric constant depends on the excess of the temperature gradient above that appropriate to an adiabatic atmosphere. In going from the upper troposphere to the stratosphere, there is a significant increase in this gradient excess and consequently, a significant increase in the intensity of irregularities in dielectric constant. The decrease in intensity with increase of height measured by Crain in the troposphere does not, therefore, indicate reliably the intensity to be expected above the tropopause. Calculations have been made concerning the effect of stratospheric, as distinct from tropospheric, scattering. Stratospheric scattering is expected to predominate over tropospheric scattering at ranges greater than about 600 km. At a range of 1000 km, the calculated transmission-loss due to stratospheric scattering is a few decibels greater than is indicated by observations. The effect of stratospheric scattering at a frequency of 108 mc is such that the minimum signal observed at this frequency over the path from Cedar Rapids, Iowa, to Sterling, Va., could conceivably have been stratospheric in origin, with ionospheric scattering being predominant at certain times, for example, during SID's. *Subject Heading:* **1. Radio wave scattering theories.**—*Authors' abstract.*

8J–158 551.594.7

Carrol, T. J. and Ring, R. M., **Propagation des micro-ondes dans la zone d'ombre à travers une couche d air dont l indice décroit de façon monotone.** [Microwave propagation in the shadow zone through an atmospheric layer with a steadily decreasing refractive index.] *L'Onde Électrique,* 37(362):471–479, May **1957.** 4 figs., 8 refs. **DLC**—Treating the troposphere as a dielectric layer stratified by gravity, a propagation model is derived by integrating several modes of propagation over a range of elevation angles. The suggested model can account for strong intensities of VHF scatter transmission without the necessity of assuming turbulence or any kind of anomalous stratification. *Subject Headings:* **1. Radio wave scattering theories 2. Tropospheric propagation 3. Dielectric influences.**—*G.T.*

8J–159 621.396.9:551.501.8

Effect of sub-refraction on radar range. *Marine Observer*, 27(176):114–116, April 1957. **DLC**—W. Burger enquired whether radar horizon at sea can be reduced to 1–3 mi as a result of sub-refraction. R. F. Jones regarded this as impossible. Capt. Wylie agreed. *Subject Headings:* **1. Radar range 2. Sub-refraction.**—*C.E.P.B.*

8J–160 551.594.7:621.396

Gossard, Earl E. (*U. S. Navy Electronics Lab.*), **Air-sea refractive index difference charts for the Mediterranean-Southeast Asia areas.** *American Meteorological Society, Bulletin*, 38(5):274–278, May 1957. 8 figs., 4 refs. Also reprinted as *U. S. Navy Electronics Laboratory, San Diego, Calif., NEL Research Report*, No. 794, May 23, 1957. **DWB**—Data for 350,000 ship observations (on punched cards at Asheville, N. C.) were used to calculate frequencies (for 5° squares) in terms of median difference and standard deviation of sea-air refractive index ($B_s - B_b$) for March–May, June–Aug., Aug.–Oct. and Nov.–Jan. for the Eastern Mediterranean, Persian Gulf, Bay of Bengal and South China Sea. The data are presented on charts and the theory and techniques explained. *Subject Headings:* **1. Refractive index charts 2. Over-water refractive index 3. Mediterranean Sea 4. Persian Gulf 5. Bay of Bengal 6. South China Sea.**—*M.R.*

8J–161 551.594.7

Gudmandsen, P., **A design chart for tropospheric scatter.** *Akademiet for de Tekniske Videnskaber, Copenhagen* (*Danish Academy of Technical Sciences*), *Microwave Laboratory Report*, P 1625, Jan. 6, 1957.—The chart developed comprises frequencies 100 to 10,000 Mc and distances 100 to 500 km and incorporates transmission power, antennae dimension, bandwidth, effective noise figure, fading margin and signal-to-noise ratio. Its procedure is given along with experimental measurements for comparison showing that the transmission loss perhaps is over-estimated. Final conclusions necessitates further measurements. If the minimum values at 400–800 Mc are not usable, higher, rather than lower frequencies are preferred. *Subject Heading:* **1. Tropospheric scattering.**—*From author's abstract.*

8J–162 551.594.7:621.396

Johler, J. R. (*Natl. Bur. of Stands., Boulder, Colo.*), **Propagation of the radio frequency ground wave transient over a finitely conducting plane earth.** *Geofisica Pura e Applicata*, Rome, 37:116–126, 1957. 6 figs., 10 refs., 22 eqs. **DLC**—The theory of the propagation of a transient radio frequency ground wave over a finitely conducting plane earth is presented for the particular case of the NORTON surface wave by a consideration of a wave interrupted abruptly at one point in time ($t=0$, T_2) and a wave interrupted at one point in time followed by an exponential decay. The first case is illustrated by several numerical examples of a cosine current wave applied to an electric dipole source. It is apparent that the method of the inverse Laplace transform for the particular cases considered yields some simple mathematical formulas. *Subject Headings:* **1. Ground wave propagation 2. Radio wave scattering theories.**—*From author's abstract.*

8J–163 551.594.7:621.396.11:551.524.4

Klinker, Ludwig, **Aufschlüsse über den Fernausbreitungsmechanismus im Meterwellenbereich durch troposphärische Driftmessungen.** [Distant propagation mechanism in the meter wave region by tropospheric drift measurements.] *Zeitschrift für Meteorologie*, 11(2):43–49, Feb. 1957. 6 figs., table, 11 refs. **DLC**—The question is discussed whether propagation of ultrashort waves to great distances is due to scattering by tropospheric turbulence elements or to partial reflection at free inversions. Fading at antennae 50–300 m apart shows systematic time differences. In many cases the drift measurements coincided with wind discontinuities at the lower limit of free inversions between 500 and 3000 m shown by upper air ascents; examples are described. About two-thirds of the observations agree with aerological data and support the occurrence of partial reflection. *Subject Headings:* **1. Ultrashort wave propagation 2. Inversions.**—*C.E.P.B.*

8J–164 551.594.7:621.396

Megaw, E. C. S., **Fundamental radio scatter propagation theory.** *Institution of Electrical Engineers, London, Proceedings*, Pt. C, 104(6):441–455, Sept. 1957. 2 figs., 5 tables, 29 refs., 83 eqs. **DLC**—The text and the arrangement of the extensive notes and analytical material left by the late author were prepared by F. A. Kitchen and M. A. Johnson. The detailed theoretical treatment of the problem of beyond-horizon scatter propagation includes a full analysis of the influence of the geometry of the scatter volume on the received field strength. The form for the spectral density of refractive index fluctuation, assumed congruent with velocity fluctuation, is derived from the universal equilibrium theory of turbulence. It is here used to predict several aspects of stellar nature and radio signal field strength fluctuation. Theoretical and experimental comparisons support the theoretical form of the refractive index fluctuation spectrum. *Subject Headings:* **1. Radio wave scattering theories 2. Refractive index variations.**—*From author's abstract.*

8J–165 551.594.7:621.396

†Moyer, V. E. and Gerhardt, J. R., **A survey of microwave refractive index analysis and forecasting techniques.** Texas. Univ. Electrical Engineering Research Laboratory, Report No. 6–18, Contract AF 19(604)-494, March 25, 1957. 16 p. 30 refs. **DWB**—The present knowledge, techniques, instrumentation and analysis in relation to the accuracy of forecasting both vertical and lateral refractive index gradients are summarized and discussed in some detail. A balloon-borne refractometer would be the ideal instrument, particularly for the meteorologist. However, such an instrument remains to be invented. Author sums up suggestions and recommendations pertinent to refractometry. *Subject Headings:* **1. Refractive index forecasting 2. Balloon borne refractometers.**—*W.N.*

8J–166 551.594.7:621.396(08)

Radio wave propagation International Colloquium in Paris. *Nature*, London, 179(4555):354–356, Feb. 16, 1957. **DWB**—Account of a meeting organized by the French National Committee of the International Scientific Radio Union and the Société des Radioélécticiens on Sept. 17–21, 1956. Tropospheric propagation of ultra-high-frequency radiation was first dealt with, including climatic effects on refractive index. Ionospheric problems included oblique-incidence propagation, ionospheric forecasts, and propagation of very low frequency radiation including atmospherics. Diffraction, scattering and reflection from rough surfaces were also discussed. *Subject Headings:* **1. Radio wave propagation 2. Symposia.**—*C.E.P.B.*

8J–167 551.594.7:621.396

Rowden, R. A. and Stark, J. W. (*both, B.B.C. Research Dept.*), **Long-distance propagation at 94.35 Mc/s over the North Sea.** *Institution of Electrical Engineers, Proceedings, Pt. B*, 104(15):210–212, May 1957. 3 figs., table. **DLC**—A number of VHF (94.35 Mc) propagation tests were made between Scheveningen, Holland (52°06′ 04°16′E) and 4 points in England, Scotland and the Shetlands (123 to 591 mi) to determine over-sea characteristics compared with previous over-land propagation data. The over-sea paths gave higher field strengths at the 1% and 10% levels than the over-land paths. In every case when relatively strong signals were received it was found that anticyclones and inversions existed over the North Sea. *Subject Headings:* **1. Radio propagation beyond the horizon (94 Mc) 2. Radio propagation over water 3. Tropospheric propagation 4. North Sea.**—*M.R.*

8J–168 551.594.7:621.396:551.551

Silberman, Richard A., **Fading of radio waves scattered by dielectric turbulence.** *Journal of Applied Physics*, N. Y., 28(4):506–511, April 1957. 2 figs., numerous foot-refs., 21 eqs. **DLC**—The fading of radio waves scattered by dielectric turbulence is shown to be the result of two effects. The first is time variation of the scattering eddies as seen in a coordinate system moving with the local wind velocity. The second is Doppler shifting produced by the convection of the scattering eddies by the mean wind and by the macro-eddies. In the troposphere, the scattering eddies lie in the inertial range of statistical turbulence theory. This makes it possible to find the envelope fading rate of the received scattered signal to within a constant of proportionality by using dimensionality and similarity arguments. The result is an expression for the fading rate as a function of carrier frequency which departs significantly from that found with "scattering blob" models. *Subject Headings:* **1. Radio fading 2. Turbulence effects.**—*Author's abstract.*

8J–169 551.594.7:621.396:535.4

†Texas. Univ. Electrical Engineering Research Lab., [**Measurements and analyses of index of refraction of the atmosphere.**] Contract AF19(604)-494, Report No. 6–19, Final Report, March 31, 1957. 16 p. Bibliog. of technical reports under the contract, and papers published in journals or presented at meetings concerned with the results of research activities under the Contract AF19(604)-494 as well as several theses. **DWB** (M94.7 T355r)—Development, installation and testing of three airborne refractometers as conducted from Aug. 1, 1952 through Feb. 28, 1957 is reviewed here. Two of the refractometers were designed for altitudes up to 30,000 ft and the third for altitudes up to 100,000 ft. Accuracy of all refractometers was 1 N-unit; the two former were direct electronically supplied, the latter was direct or battery supplied for power. *Subject Headings:* **1. Refractometers 2. Tropospheric profiles 3. Refractive index measurement.**—*W.N.*

8J–170 551.594.7

†U. S. National Bureau of Standards. Boulder Laboratories, Colorado, **Second annual report, July 1, 1955–June 30, 1956.** *U. S. National Bureau of Standards, NBS Report* 3592, **1957.** 137 p. List of publications and report, 1946–July 1, 1956. **DWB** (621.384 U583a)—Among the reports of the various sections of the Boulder Laboratories are those of the Upper Atmosphere Research Section (T. N. Gautier, Chief), the Ionospheric Research Section (R. C. Kirby, Chief), the Sun-

Earth Relationship Section (A. H. SHAPLEY, Chief), and the Radio Propagation Engineering Division with its Tropospheric Propagation Research Section (J. W. HERBSTREIT, Chief). The last named section has made studies on terrain effects, tropospheric effects, airborne refractometers, phase stability, and specific projects at Cheyenne Mountain and on the Pacific Coast. A list of nearly 400 papers published by the Central Radio Propagation Laboratory (1943–1956) is included among other reports listed. *Subject Headings:* **1. Boulder (Colo.) Laboratories reports 2. Tropospheric propagation research 3. Ionospheric radio wave propagation 4. Tropospheric propagation bibliography 5. Boulder, Colo.**—*M.R.*

8J–171 551.594.7

U. S. National Bureau of Standards. Boulder Laboratories, Boulder, Colo., **Third Annual Report, July 1, 1956–June 30, 1957.** *U. S. National Bureau of Standards, NBS Report*, 5510, **1957.** 184 p. List of publications 1946–July 1, 1957, appended. **DWB** (621.384 U583a)—Among the many projects being conducted at the Boulder Laboratories as outlined in the 1956–57 fiscal year report are a score in the fields of ionospheric and tropospheric propagation of short and long waves and atmospherics. The Radio Propagation Engineering Division has continued the work mentioned in the 1955–56 report, and has initiated some new projects. Seven technical sections deal with: 1) low frequency propagation, 2) tropospheric forward scatter propagation, 3) atmospheric turbulence, 4) refraction or bending of radio rays, 5) modulation, 6) navigation systems, 7) radio noise studies. Details of the projects under these sections are reported, including refractometer research, data reduction research, tropospheric propagation measurements (in Maui, Hawaii), radio meteorological research (under which this bibliography was compiled), tropospheric scatter theory, tropospheric data analysis, terrain effects on propagation, refractive index climatology, etc., etc. Papers published by NBS are listed. *Subject Headings:* **1. Boulder (Colo.) Laboratories reports 2. Tropospheric propagation research 3. Tropospheric propagation bibliographies 4. Boulder, Colo.**—*M.R.*

8J–172 551.515.11:532.517.4

†Wheelon, Albert D., **Spectrum of turbulent fluctuations produced by convective mixing of gradients.** *Physical Review*, 105(6):1706–1710, March 15, **1957.** fig., 199 refs., 5 eqs. **DLC**—Isotropic fluctuations of a passive scalar ψ produced by turbulent convection are investigated. The source of irregularities is considered to be the turbulent mixing of an established gradient of ψ. The mixing velocity field is described by Heisenberg's spectrum for homogeneous, isotropic turbulence. Replacing the (self-mixing) transfer of energy down the spectrum by an equivalent diffusion term, the local fluctuation spectrum becomes

$$S(k) = (\nabla\psi)^2 \frac{1}{k^3} \frac{1}{[1 + (k/k_s)^4]^{4/3}} \frac{1}{[1 + (k/k_s)^4/3]^2},$$

where k_s is the viscosity cutoff wave number of the velocity field. In the inertial range ($k \ll k_s$) this result agrees with spectrum deduced from purely dimensional arguments. Support for the above spectrum comes from the scattering of radio waves by dielectric fluctuations in the troposphere and ionosphere. *Subject Heading:* **1. Turbulence spectrum.**—*Author's abstract.*

8J–173 551.594.7:535.314

Wheelon, Albert D. (*Ramo-Wooldridge Corp., Los Angeles*), **Relation of radio measurements to the spectrum of tropospheric dielectric fluctuation.** *Journal of Applied Physics*, N. Y., 28(6):684–693, June **1957.** 10 figs., 20 refs., numerous eqs. **DLC**—The size spectrum of isotropic fluctuations in the troposphere's dielectric constant is related to quantities measured by radio means. Two classes of experiments are analyzed: (1) line-of-sight phase and amplitude instability and (2) refractometer measurements of dielectric fluctuations. This analysis is independent of models for the dielectric fluctuations and provides a system from which the spectrum can be estimated from experimental data. The measured quantities are expressed as weighted integrals of the spectrum, many of which may be inverted to give the spectrum directly in terms of the data. Aerial smoothing by the receivers and finite data sample effects are studied, in addition to the basic propagation mechanisms. *Subject Headings:* **1. Tropospheric propagation 2. Refractometer measurements.**—*Author's abstract.*

8J–174 551.594.7:621.396

Wiesner, Jerome B., **New methods of radio transmission.** *Scientific American*, N. Y., 196(1):46–51, Jan. **1957.** 8 figs. (incl. photos). **DWB, DLC**—A non-technical, illustrated article on the fundamentals of ionospheric and tropospheric propagation, and especially on "scatter propagation" from the troposphere and ionosphere. The latter enables fairly long distance communication by means of 30 to 70 megacycle waves, but equipment and operations are costly. Line-of-sight (30 mi) transmission is much cheaper but requires more installation and personnel, and is not always possible in Arctic or at sea. Some of the giant antenna used (e.g. at Cedar Rapids, Iowa and S. Dartmouth, Mass.) are illustrated. *Subject Headings:* **1. Scatter propagation 2. Ionospheric scattering.**—*M.R.*

8J–175 551.594.7

Wiltse, J. C.; Schlesinger, S. P. and Johnson, C. M., **Back-scattering characteristics of the sea in the region from 10 to 50 KMC.** *Institute of Radio Engineering, N. Y., Proceedings*, 45(2):220–228, Feb. **1957.** 11 figs., 9 refs., 7 eqs. **DLC**—Measurements of radiation back scattering from the ocean have been made over the frequency range from 10 to 50 kmc by means of several cw, Doppler, microwave systems operating simultaneously. The systems were mounted on the bow of a ship and various antenna depression angles from 0° (horizontal) to 90° were used. Data were obtained for vertical, horizontal, and circular polarization, and for the cross-polarized component of vertically polarized radiation. Horn antennas of 20 db gain were used at all of the operating frequencies and, in addition, higher and lower gain antennas were used at certain selected frequencies. Signals recorded from a variety of sea conditions have been used to calculate the back-scattering cross section per unit area, σ°, and these calculations indicate that σ° is nearly constant with microwave frequency and increases as the antenna depression angle is increased. The Doppler frequency characteristics of the returned signals have also been obtained from these measurements. A comparison is made between the experimental results and the characteristics predicted from simple scattering mechanisms. *Subject Heading:* **1. Radiation back scattering from the ocean.**—*Authors' abstract.*

SUPPLEMENTARY MATERIAL

8J–176 551.594.7:621.396

Fine, H., **Some notes on theory of radio scattering in a randomly inhomogenous atmosphere.** *Institute of Radio Engineers, Proceedings*, 41(2):294, Feb. **1953.** eqs. **DLC**—A time-space correlation function is offered. Brief reference to BOOKER and GORDON's space correlation and STARAS' time correlation is given. *Subject Heading:* **1. Radio wave scattering theories.**—*W.N.*

8J–177 551.594.7:621.396

*Herbstreit, J. W.; Rice, P. L. and Short, P. J. (*all, Central Radio Propagation Lab.*), **Catalog of available tropospheric field strength data.** *U. S. National Bureau of Standards, NBS Report*, 2915, Oct. 28, **1953.** 75 p. mostly tables. **DWB**—At frequencies above 50 Mc climate, meteorological conditions in the troposphere, and the shape of terrain irregularities play the principal roles in determining the strength and distance that a signal will be propagated. A catalog of tropospheric propagation radio field strength data covering approximately 200 propagation paths for distances from 33 to 616 mi and frequencies from 41 to 1046 Mc is presented in order to disseminate the information available at the National Bureau of Standards. *Subject Headings:* **1. Radio field strength data 2. Propagation paths 3. Tropospheric propagation.**—*Authors' abstract.*

8J–178 551.594.7:621.396

Bean, B. R., **Some meteorological effects on scattered radio waves.** *Institute of Radio Engineers. Professional Group on Communications Systems, Transactions*, CS-4(1):32–38, March **1956.** 12 figs., 9 refs., 4 eqs. **DLC.** Also as: *U. S. National Bureau of Standards, NBS Report*, No. 3561, Dec. 15, **1955.** 9 p. **DWB**—The long term variations of received scattered fields due to atmospheric effects are estimated for frequencies of 100 to 50,000 Mc and over propagation paths of 100 to 1000 mi. The long term variations are presented in two parts: (1) empirically derived variations excluding absorption and (2) theoretically derived variations due to gaseous atmospheric absorption. The absorption effects are obtained by following a scattered radio wave through an actual atmosphere. *Subject Headings:* **1. Tropospheric scattering 2. Radio fading 3. Absorption of radio waves.**—*Author's abstract.*

8J–179 551.594.7:621.396

Iakovlev, O. I., **Uchet vysot antenn v teorii troposfernogo rasseianiia metrovykh radiovoln.** [Taking antenna height into account in the theory of tropospheric scattering of meter waves.] *Radiotekhnika i Elektronika*, Moscow, 1(3):309–312, **1956.** 3 figs., 3 refs., 12 eqs. **DLC.** English translation available from Morris D. Friedman, Inc., Needham Heights, Mass., as their MDF I-112. —The dependence of field strength well beyond the horizon on antenna height is investigated on the basis of tropospheric scatter propagation theory. It is shown that interference in the region of scattering has to be taken into account in calculating the scatter field. By accounting for interference between the direct waves and those reflected from the ground it is possible to determine the dependence of the received signal intensity on antenna height. *Subject Headings:* **1. Radio wave scattering theories 2. Radio antenna heights 3. Radio field strength.**—*Trans. of author's abstract.*

8J–180 551.594.7:621.396

Norton, Kenneth A., **Point-to-point radio relaying via the scatter mode of tropospheric propagation.** *Institute of Radio Engineers. Professional Group on Communications Systems, Transactions,*

CS-4(1):39–49, March 1956. 7 figs., table, 32 refs., 29 eqs. **DLC**—Formulas are given for determining the transmitter power required to provide a specified grade of service in point-to-point radio relaying of the following types of signals: television, frequency modulation high fidelity music, frequency modulation voice, frequency shift telegraph, and a just measurable signal. Allowance is made for the antenna gains, the carrier frequency, the system bandwidth, distance, the antenna heights above the ground and the effects of the terrain and the atmosphere along the transmission path. The formula for the transmission loss allows separately for the effects of the actual distance, the angular distance and the antenna heights, and this separation of the influence of these variables provides the basis for the development of rules for the efficient siting of the terminals of a tropospheric forward scatter relay circuit. *Subject Headings:* **1. Point-to-point radio propagation 2. Tropospheric propagation beyond the horizon.**—*Author's abstract.*

8J–181 551.594.7:621.396

Shabel'nikov, A. V., **Vliianiia vida funktsii raspredeleniia dielektricheskoĭ pronitsaemosti vozdukha s vysotoĭ na refraktsiiu radiovoln v nizhnikh sloiakh atmosfery.** [Influence of the form of the vertical distribution function for dielectric permeability of the air on the refraction of radio waves in the lower layers of the atmosphere.] *Radiotekhnika i Elektronika*, Moscow, 1(3):277–280, **1956.** fig., 5 refs., 13 eqs. **DLC**—The dependence of the angle of refraction on the vertical distribution of atmospheric dielectric permeability is analyzed theoretically by means of a method of variation calculation. It is shown that no such dependence exists at zenith angles comprised between 0° and 80°. *Subject Headings:* **1. Tropospheric scattering 2. Tropospheric refraction 3. Dielectric influences.**—*Trans. of author's abstract.*

8J–182 551.594.7:621.396.9

*U. S. National Bureau of Standards, **Cheyenne Mountain tropospheric propagation measurements, Aug. 1954.** Its *NBS Report*, No. 3568, Feb. 6, **1956.** 12 p. 54 figs., 41 tables, 8 refs. **DWB** (621.384 U585ch)—Recordings of transmission loss on five frequencies over most of the Cheyenne Mountain transmission paths were made during Feb. and Aug. 1954 along with simultaneous meteorological measurements. A description of the Feb. measurements and an analysis of the radio and meteorological data were presented in an earlier report (*see* 8J–66). In this report a similar analysis of the data recorded during Aug. is presented and the Aug. and Feb. data compared. The analysis of the Aug. radio data included in this report consists of the determination of the hourly median values of basic transmission loss for each path and frequency. These are presented in tabular form and are also plotted versus time of day to show the diurnal cycle in each instance. The median basic transmission loss is shown as a function of the angular path distance, θ. The meteorological data consist of hourly temperature profiles measured on the 500 ft tower at the Haswell recording site, and the median surface refractivity plotted versus time of day for several U. S. Weather Bureau stations located near the transmission paths. *Subject Headings:* **1. Tropospheric scattering 2. Radio transmission loss. I. Janes, H. B. II. Bean, B. R.**—*From authors' summary.*

8J–183 551.594.7:621.396

Vysokovskiĭ, D. M., **Nekotorye osobennosti rascheta radiorefraktsii.** [Some peculiarities in radio refractivity calculation.] *Radiotekhnika i Elektronika*, Moscow, 1(3):274–276, **1956.** 3 refs., 14 eqs. **DLC**—Expressions of radio refraction, in the form of an integral and of a progression, and their applications to computation problems are discussed. Conditions are determined, under which refraction is independent of the form of the vertical distribution function of the index of refraction. *Subject Headings:* **1. Tropospheric scattering 2. Tropospheric refraction 3. Refractive index computations.**—*Trans. of author's abstract.*

8J–184 551.594.7:621.396

Barsis, Albrecht P., **Long-distance tropospheric propagation data over Cheyenne Mountain paths.** *U. S. National Bureau of Standards, NBS Report*, No. 5072, May 7, **1957.** 12 p. 11 figs., tables, 14 refs. **DWB** (621.384 U5851o)—Results of measurements of basic transmission loss over 400 and 600 mi paths are presented in the form of distributions of hourly medians for frequencies in the 100 to 1000 Mc range. The paths extend southeastward from the Front Range of the Colorado Rockies, and transmitting antennas were located at 6200, 7500, 8800, and 14,100 ft above mean sea level. Data are available for periods representing typical summer and winter months. *Subject Headings:* **1. Tropospheric scattering 2. Radio transmission loss.**—*Author's abstract.*

8J–185 551.594.7:621.396

Bean, B. R. (*NBS Boulder, Colo.*), **Sur l'utilisation des observations météorologiques courantes en propagation radioélectrique.** [On the use of available meteorological data in radio wave propagation.] *l'Onde Électrique*, Paris, 37(362):411–415, May **1957.** 4 figs., 19 refs. **DLC**—The use of

meteorological data in climatological studies of atmospheric refractivity is discussed with special reference to work done by the U. S. National Bureau of Standards. It is reported that 2½ million complete sets of data have been recorded on punched cards, representing 10 years of surface observations made every 2 hours at 54 stations throughout the United States. A study of the global distribution of refractivity index has also been undertaken. World charts showing mean values of surface refractivity in Feb. and in Aug. are presented. *Subject Headings:* **1. Tropospheric scattering 2. Refractive index data 3. Punched card programs.**—*G.T.*

8J–186 551.594.7:535.314

Beyers, Norman J., **Airborne refractometer installation.** *U. S. White Sands Signal Corps Agency, Electromagnetic Radiation through the Atmosphere, Progress Report*, No. 2, Jan. 11, **1957.** 9 p. 5 figs., ref.—The air-borne Type VI Microwave Refractometer developed by the Electrical Engineering Research Laboratory at the University of Texas is briefly described and shown in photographs and diagrams. The instrument measures atmospheric index of refraction at a frequency of approximately 9400 Mc, providing a continuous record of the index of refraction versus altitude. Its main parts are 1) the refractometer proper, 2) the power supply and 3) the recording meter. *Subject Headings:* **1. Air-borne refractometers 2. Refractive index.**—*G.T.*

8J–187 551.594.7:621.396(08)

†*Colloque International sur les Problèmes d'Actualité dans la Propagation des Ondes Radioélectriques, Paris, Sept. 17–21, 1956, [**Communications**]. *l'Onde Électrique*, Paris, 37(362):411–542, May **1957.** And: *Annales des Télécommunications*, Paris, 12(5):135–216, May **1957.** numerous figs., tables, refs., eqs. **DLC**—Eighty papers were presented at the International Symposium on Radio Wave Propagation in Paris (Sept. 1956). Of these 27 are included in **Onde Électrique** (covering the fields of scatter propagation, theory, fluctuations, whistlers and meteors) and 23 in **Annales des Télécommunications** (ionospheric propagation, radio meteorology, effect of irregular surface, and antennas), while the remaining 30 are listed in both journals by title only. The following papers bear direct relationship to the subject of this bibliography:

Bean, B. R. (*NBS, Boulder, Colo.*), **Sur l'utilisation des observations météorologiques courantes en propagation radioélectrique,** [On the use of available meteorological data in radio wave propagation], *l'Onde Électrique*, p. 411–415. (For abstract, *see item* 8J–185)

Beckmann, B. (*Darmstadt, Germany*), **Observations de diffusion vers l'arrière avec des signaux télégraphiques,** [Observation of back scattering with telegraph signals], p. 416–420. Describes new "annular" method developed in Germany.

Carroll, Thomas J. (*M.I.T. Lincoln Lab.*), **La propagation des ondes ultra-courtes au delà de l'horizon de Marconi à nos jours,** [Propagation of ultrashort waves beyond the horizon from Marconi to the present], p. 421–426. Short history including 38 references.

Chisholm, James H. (*M.I.T. Lincoln Lab.*), **Recherches expérimentales sur la diffusion angulaire et sur les possibilités d'utilisation de la propagation troposphérique pour les communications bien au delà de l'horizon,** [Experimental investigation of angular scattering and possibilities of the use of tropospheric propagation for communication well beyond the horizon], p. 427–434. Describes installation used at Lincoln Laboratories for measuring attenuation of shortwave radio signals over long tropospheric paths (up to 830 mi).

Clavier, P. (*Compagnie Française Thomson, Houston*), **Calcul d'une liaison par diffusion troposphérique optimum du point de vue économique,** [Calculation of optimum tropospheric scatter communication from an economic point of view], p. 435–440. Considers performance characteristics of the various components of scatter propagation equipment and indicates best choice of apparatus for operation at reduced cost.

Crain, C. M. (*Texas Univ., Austin*), **Les refractomètres et leurs applications a la propagation radioélectrique et a d'autres problèmes,** [Refractometers and their applications to radio wave propagation and to other problems], p. 441–443. Discusses airborne refractometers and results obtained with them in the measurement of atmospheric refractivity variations with height and with atmospheric conditions.

Morrow, W. E., Jr. (*M.I.T., Lincoln Lab.*), **Étude de systèmes de radiocommunication troposphérique U.H.F. à longue distance,** [A study of methods of tropospheric UHF radio communication over long distances], p. 444–449. Includes schematic diagrams of equipment used in scatter propagation studies and graphical presentation of results.

Wiesner, J. B. (*M.I.T.*), and Poté, A. J. (*Hycon Eastern*), **Liaisons radioélectriques au moyen de la propagation par diffusion troposphérique,** [Radio communication by means of tropospheric scatter propagation], p. 456–461. General review of tropospheric propagation beyond the horizon and of work conducted at Lincoln Laboratories.

Bochenek, K. (*Warsaw, Poland*), **Sur certaines méthodes d'analyse des relations obtenues à l'aide de la méthode W.K.B.,** [On certain methods of analysis of the relations obtained by means of the W.K.B. method], p. 462–464. Mathematical analysis of the possible application of geometrical optics to radio wave propagation.

Boudouris, Georges (*Paris*), **Le problème de propagation au dessus de la terre sphérique** (terre et atmosphère homogènes) **est-il définitivement résolu?** [Is a final solution available on the problem of propagation over a spherical earth (homogeneous earth and atmosphere)], p. 465–470. Reviews classical and recent theories of radio wave propagation and concludes that while the theoretical problems have been solved satisfactorily, no adequate method has been developed for quick and complete field calculations.

Carroll, Thomas J. and Ring, R. M. (*M.I.T. Lincoln Lab.*), **Propagation des micro-ondes dans la zone d'ombre a travers une couche d'air dont l'indice décroit de façon monotone,** [Microwave propagation in the shadow zone through a layer of air whose index decreases uniformly], p. 471–479. Shows that excessive field strengths observed in the shadow zone can be explained by an atmospheric wave guide effect without any additional effect of turbulence or unusual stratification.

Fock, V. A. (*Moscow, U.S.S.R.*), **Application des intégrales complexes a certains problèmes de diffraction,** [Application of complex integrals to certain problems of diffraction], p. 480–481. Author briefly sums up his own work on the theory of radio wave propagation and refers to 13 papers published by him since 1945.

Goubau, Georg (*Signal Corps Eng. Lab.*), **Rapport entre l'onde de surface et l'onde d'espace,** [Relation between the ground wave and the sky wave], p. 482–484. Considers theoretically the problem of separating the field due to the ground wave from that due to the sky wave.

Smyth, J. B. and Anderson, L. J. (*San Diego, Calif.*), **L'Importance du processus de réflexion dans les communications au delà de l'horizon,** [Importance of reflection in communication beyond the horizon], p. 485–490. Reports results of airborne refractometer measurements throughout the United States and discusses mechanisms of radio wave reflection from tropospheric layers.

Wong, Ming S. (*Wright Aeron. Develop. Center, Ohio*), **Méthode des caustiques dans la propagation troposphérique,** [The method of caustic in tropospheric propagation], p. 491–494. Shows that anomalies observed in air-to-air propagation can be explained by stable horizontal layers, and anomalies of ground-to-air propagation by fragments of layers, and layers moving horizontally.

Arsac, J. (*Meudon Obs., France*) and Simon, J. C. (*Paris*), **Problèmes de fluctuation en propagation lointaine,** [Problems of fluctuation in long-distance propagation], p. 495–497. Discusses possibilities of an application of radio field measurement to the study of atmospheric irregularities.

Bremmer, H. (*Philips Res. Lab., Netherlands*), **Comparaison des fluctuations de l'amplitude et de la phase des champs engendrés par diffusion** (champs de turbulence), [Comparison of the amplitude and the phase variations of fields due to scattering (turbulence fields)], p. 498–500. The statistical theories developed by Rice for the study of noise and by Booker, Ratcliffe and Shinn for the study of ionospheric propagation are extended and applied to the study of field strength and phase variations in scatter propagation.

Du Castel, F. (*Lab. Nat. de Radioélectricité, France*), **Divers types de fluctuations de champs troposphériques et leur interprétation physique,** [Different types of tropospheric field variations and their physical interpretation], p. 501–506. Reports results of work done at the French Telecommunications Research Center and presents graphs of field strength variations as functions of various meteorological and technical factors.

Tukizi, Osamu (*Tokyo, Japan*), **Theorie du fading de scintillation en micro-ondes,** [Theory of scintillation fading of microwaves], p. 512–519. Suggests that scintillation fading may be interpreted as being due to interference between direct and scattered waves.

Anastassiades, M. and Carapiperis, L. (*Athens, Greece*), **Influence des facteurs météorologiques sur la propagation des hyperfréquences (Données sur la Mer Egée du sud),** [Effect of meteorological factors on UHF propagation (Data for the southern Aegean Sea)], *Annales des Télécommunications*, p. 177–180. From field measurements over a 120 km maritime path (Thera Heraklion) it is concluded that propagation conditions may be predicted correctly in simple weather situations such as frequently prevail in the region investigated.

Battaglia, A. (*Pisa*), Boudouris, G. (*Paris*) and Gozzini, A. (*Pisa*), **Sur l indice de réfraction de l'air humide en microondes,** [Index of refraction of humid air for microwaves], p. 181–184. Reports laboratory measurements made at the Institute of Physics at Pisa University, by means of a spectrometer.

Beckmann, Petr (*Czechoslovakia*), **La réflection des ondes VHF par les variations brusques d'humidité dans la troposphère,** [Reflection of VHF waves by abrupt humidity variations in the troposphere], p. 50–52. Sharp discontinuities of humidity at the boundaries of clouds show high correlation with propagation beyond the horizon.

Mevel, J. (*Rennes, France*), **Étude sur l'interaction de deux sphères voisines placées dans un champ électromagnétique,** [Interaction of two adjacent spheres in an electromagnetic field], p. 186–188. Considers the theory of diffraction of radio waves by cloud particles.

Misme, Pierre (*Paris*), **Influence des discontinuités frontales sur la propagation des ondes décimétriques et centimétriques,** [Effect of frontal discontinuities on the propagation of decimeter and centimeter waves], p. 189–194. Analysis of field measurements over a 50 km maritime path during a frontal passage, and of measurements made during a shower.

In addition to these papers printed in full, there are also several on tropospheric propagation among those listed by title only. *Subject Headings:* **1. Radio wave propagation symposia 2. Tropospheric propagation. I. International Scientific Radio Union. Comité National Français de Radioélectricité Scientifique II. Société des Radioélectriciens.**—*G.T.*

8J–188 551.594.7:621.396.11

De, A. C.; Das, P. M. and Gangopadhayaya, M., **Super-refraction conditions at Dum Dum Airport.** *Indian Journal of Meteorology and Geophysics*, Delhi, 8(4):418–426, Oct. **1957.** 5 figs., table, 8 refs. **DWB, DLC**—Conditions for superrefraction have been studied at Dum Dum Airport (Calcutta) with a 3-cm radar. There appears to exist some correspondence between the occurrence of ground fog and mist on the one hand and the appearance of super-standard echoes on the other. *Subject Headings:* **1. Superrefraction 2. Tropospheric propagation 3. Dum Dum Airport, Calcutta, India.**—*Authors' abstract.*

8J–189 551.594.7:621.396

†*Phillpot, H. R., **Effects of meteorological conditions on ultra high frequency radio transmission over two water paths in Australia.** *Australia. Bureau of Meteorology, Meteorological Study*, No. 11, July **1957.** 27 p. 10 figs., 6 tables, 18 refs., eqs. **DWB**—The effects of atmospheric refraction on electromagnetic waves of various frequencies are discussed, and the basic theory of the effect of variations in the atmospheric parameters on the refractive index of the lower troposphere is reviewed. Results of earlier investigations made over sea paths in the United Kingdom, United States of America and New Zealand are considered, and the current work in Australia for two links, at Mt. Bonython–Yorketown (South Australia) and Melbourne–Arthur's Seat (Victoria) is outlined. A technique is developed whereby it is possible approximately to assess the percentage occurrence of fading which might be expected on any proposed over-water microwave link, the significant parameters being the temperature difference between the air and the underlying sea surface and the geostrophic wind speed. *Subject Headings:* **1. UHF radio propagation 2. Electromagnetic wave refraction 3. Over-water refractive index 4. Australia.**—*Author's abstract.*

8J–190 551.594.7:535.314

Thompson, M. C., Jr. and Vetter, M. J., **NBS airborne microwave refractometer, Model 2.** *U. S. National Bureau of Standards, NBS Report*, No. 5056, April 10, **1957.** 9 p. 31 figs., ref. **DWB** (537.12 U585mb)—This report describes a microwave refractometer developed for the U. S. Army Electronic Proving Ground, Fort Huachuca, Arizona, to be used in tropospheric radio propagation research. Circuit and construction details are described and the installation and performance in an L-20 type aircraft are discussed. *Subject Headings:* **1. Air-borne refractometers 2. Tropospheric scattering 3. Fort Huachuca, Arizona.**—*Authors' abstract.*

PART III. REVIEWS, TRANSLATIONS, REPRINTS, ROUTINE PUBLICATIONS, AND ANALYTICS FROM RECENT SERIALS AND COLLECTED WORKS

Note: Material listed in these sections will not be included in the monthly indexes until abstracted. The item number is mentioned for those titles which have been abstracted in previous issues of **Meteorological Abstracts and Bibliography.**

A. REVIEWS OF IMPORTANT METEOROLOGICAL MATERIAL

American Geophysical Union: **Antarctica in the International Geophysical Year, based on a symposium on the Antarctic.** Contributions by A. P. Crary and others. *AGU Geophysical Monograph*, No. 1, 1956. (This is also *National Research Council, Publication*, No. 462.) 133 p. (*For listing of contents of this* **Monograph,** *see* 7(11):1445, Nov. 1956, *MAB*.) Review by M. M. Sweeting in *Journal of Glaciology*, London, 3(22):150, Oct. 1957.

Charney, J. G. and Eliassen, A.: **Numerical method for predicting the perturbations in the middle latitude Westerlies.** (In) *Tellus*, Stockholm, 1:38–54, 1949. Comments by T. Watanabe in *Journal of Meteorological Research*, Tokyo, 9(6):449–450, July 1957. 4 refs., 4 eqs. (*For abstract on original, see* 5F–21, June 1954, *MAB*)

Encyclopedie Française: **Le ciel et la terre** [Sky and earth]. (Vol. 3 of the **Encyclopedia.**) Paris, Larousse, 1956. Pub. under the direction of Messers. Danjon, Pruvost and Blache. 452 p. 335 figs. and plates. Price, francs 7450. Review in *Ciel et Terre*, Brussels, 73(3/4):226–227, March/April 1957.

Evans, Frank: **The voyage of the Petula.** London, Robert Hale Ltd., 1957. 189 p. figs. Price sh. 16. Review in *Weather*, London, 12(10):329, Oct. 1957.

Great Britain. Meteorological Office: **Weather map: an introduction to weather forecasting.** 4th ed. London, 1956. 105 p. Review by A. Mainhout in *Ciel et Terre*, Brussels, 73(3/4):227, March/April 1957. Review by F. H. Ludlam in *Weather*, London, 12(5):165–166, May 1957. (*See* 8.6–16, June 1957, *MAB*)

Kratzer, P. Albert: **Das Stadtklima** [City climate]. Brunswick, Vieweg, 1956. 184 p. 78 figs., tables, 563 refs. Review by F. Steinhauser in *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B*, 8(1):131–132, 1957. (*See* 8.8–15, Aug. 1957, *MAB*)

Krichak, O. G.: **Sinopticheskaia meteorologiia** [Synoptic meteorology]. Leningrad, Gidrometizdat. 1956. 530 p. 295 figs. (incl. photos), 12 tables. Review by M. P. Leonov in *Meteorologiia i Gidrologiia*, Leningrad, No. 7:53–56, July 1957. (*See* 8.8–16, Aug. 1957, *MAB*)

Kuiper, Gerard P. (*ed.*): **The sun (Vol. 1 of The solar system).** Chicago, Univ. of Chicago Press. 1953. 745 p. Price $12.50. Review in *Royal Meteorological Society, Quarterly Journal*, 83(355):137–138, Jan. 1957. (*See* 5.8–5, Aug. 1954, *MAB*)

Loewe, Fritz: **Études de glaciologie en Terre Adélie, 1951–1952** [Studies of the glaciology of Adélie Land, 1951–1952]. *Expéditions Polaires Françaises*, [*Publication*] No. 9, pub. Paris, Hermann, 1956. (*Actualités Scientifiques et Industrielles*, No. 1247.) 159 p. 19 figs., 8 plates. Review by H. H. Lamb in *Journal of Glaciology*, London, 3(22):148–149, Oct. 1957.

Pierson, Willard, Jr.; Neumann, Gerhard and James, Richard W.: **Practical methods for observing and forecasting ocean waves by means of wave spectra and statistics.** *U. S. Hydrographic Office, H. O. Publication*, No. 603, 1955. 284 p. Numerous figs. and tables. Bibliog., p. 281–284. Review by C. L. Bretschneider in *American Geophysical Union, Transactions*, 38(2):264–266, April 1957. Also **Comments on Bretschneider's Review,** by W. H. Munk, Gerhard Neumann and W. J. Pierson, Jr. *Ibid.*, 38(5):778–781, Oct. 1957.

Sawyer, J. S.: **Ways of the weather.** London, A. & C. Black, 1957. 97 p. 38 figs., 15 plates. Price 12sh 6d. Review by R. S. Read in *Weather*, London, 12(6):198, June 1957. Review in *Royal Meteorological Society, Quarterly Journal*, 83(357):412, July 1957.

Ungeheuer, Hans: **Ein meteorologischer Beitrag zu Grundproblemen der Medizin-Meteorologie** [Meteorological contribution to the basic problems of medical meteorology]. *Germany. Deutscher Wetterdienst, Berichte*, No. 16, 1955. 32 p. 23 figs., 7 tables, 42 refs. Review by Chełchowski in *Przegląd Geofizyczny*, Warsaw, 1(1):91–92, 1956. (*See* 7.3–271, March 1956, *MAB*)

U.S.S.R. Glavnoe Upravlenie Gidrometeorologicheskoĭ Sluzhby. Moskovskoe Upravlenie: **Agroklimaticheskiĭ spravochnik po Moskovskoĭ oblasti** [Agroclimatic handbook for the Moscow Province]. Leningrad, Gidrometizdat, 1954. 191 p. Bibliog., p. 155–156. Review by A. M. Shul'gin in *Meteorologiia i Gidrologiia*, Leningrad, No. 1:56–57, Jan. 1957.

U. S. Corps of Engineers. Snow Investigations: **Snow hydrology—a summary report of the snow investigations.** Pub. by North Pacific Div., Corps of Engineers, U. S. Army, Portland, Oregon, 1956. 437 p. 70 p. of plates, maps and figs. Review by W. Allard in *Journal of Glaciology*, London, 3(22):149, Oct. 1957. Review by W. Friedrich in *Die Wasserwirtschaft*, Stuttgart, 47 (12):322, Sept. 1957. (*See* 8.3–14, March 1957, *MAB*)

Winston, Jay S. (*ed.*): **Forecasting tornadoes and severe thunderstorms.** *U. S. Weather Bureau, Forecasting Guide*, No. 1, Sept. 1956. 34 p. 42 figs., 55 refs. Review in *Nature*, London, 179(4557):460–461, March 2, 1957. (*See* 8C–37, March 1957, *MAB*)

B. TRANSLATIONS, REPRINTS AND ROUTINE PUBLICATIONS

Translations

Rossby, Carl Gustav: **The scientific basis of modern meteorology.** (In) *U. S. Dept. of Agriculture, Yearbook*, 1941, p. 499–655. 38 figs., 24 refs. Also reprinted as Ch. 7 in Berry, Frederick A., et al., **Handbook of meteorology.** pub. N. Y., McGraw-Hill, 1945. Trans. into Spanish by Pedro Geoffroy Rivas, in *Sociedad Mexicana de Geografía y Estadística, Boletín*, 78(2):103–187, Sept./Oct. 1954. 38 figs., 24 refs. (*For abstracts on original English, see* 2A–105 *and* 2D–22, Jan. and April 1951, *MAB*)

Schmauss, August and Wigand, Albert: **Die Atmosphäre als Kolloid** [The atmosphere as a colloid]. *Collection Vieweg*, Brunswick, No. 96, 1929. Trans. into English available Special Libraries Association, Translation Center (John Crerar Library), as its *Translation* 3087. 53 p. (*See* C–11, March 1950, *MAB*)

Shklovskiĭ, I. S.: **O prirode svecheniia poliarnykh siianiĭ** [Nature of the luminescence of the aurora]. (In) *Akademiia Nauk SSSR. Krymskaia Astrofizicheskaia Observatoriia, Izvestiia*, 8:51–79, 1952. fig., 31 refs., 10 eqs. Trans. into English available from ASTIA (U. S. Armed Services Technical Information Agency), as its No. F-TS-8989/V. (*See* 5C–222, March 1954, *MAB*)

Shuleĭkin, V. V.: **Vydelenie mussonnoĭ sostavliaiushcheĭ iz obshchikh potokov v atmosfere** [Separation of the monsoon component from the general circulation of the atmosphere]. (In) *Akademiia Nauk SSSR, Doklady*, 71(6):1057–1060, April 1950. 4 figs., 3 refs. Trans. into English by E. R. Hope, issued as *Canada. Defence Research Board, T*-248-R, June 1957. 4 p. 4 figs., etc. (*Available for reference DWB.*) (*For abstract on original, see* 2.6–51, June 1951, *MAB*)

Šolc (*sometimes* Scholts), Ivan: **Novyĭ tip fil'tra s dvoĭnym lucheprelomleniem** [New type of birefringent filter]. (In) *Chekhoslovatskiĭ Fizicheskiĭ Zhurnal* (*Czechoslovak Journal of Physics*), Prague, 4(1):53–66, 1954. Also his: **Dal'neĭshie issledovaniia fil'tra dvoĭnogo lucheprelomleniia** [Further investigation of the birefringent filter]. *Ibid.*, 5(1):80–86, 1955. Trans. into English by Garry Boyer and David Krauss. Issued by American Meteorological Society under Contract AF 19(604)-1936, April 1956. 33 p. figs., refs., eqs.

Sugaya, Juji: [**Congelation-structure and frost-heaving ratio at Assan, Manchuria.**] Trans. into English by E. R. Hope from unpublished manuscript. Issued as *Canada. Defence Research Board*, T-54-J, Jan. 25, 1956. 16 figs. (incl. photos), 8 tables, foot-refs., 5 eqs. (*Available for reference, DWB*)

Reprints

Crease, J.: **Propagation of long waves due to atmospheric disturbances on a rotating sea.** (In) *National Institute of Oceanography, Wormley, Collected Reprints*, 4(136), 1956. (4 p.) 5 figs. 3 tables, 10 refs., 58 eqs. (*For abstract on this paper from another source, see* 7.10–40, Oct. 1956 *MAB*)

Fleming, Richard H. and Elliott, F. E.: **Some physical aspects of the inshore environment of the coastal waters of the United States and Mexico.** (In) *International Geographical Congress, 17th, Wash., D. C., Aug. 1952, Proceedings*, pub. 1956? p. 409–416. 4 figs., 22 refs. (*See* 8.5–85, May 1957, *MAB*)

Hay, J. S. and Pasquill, F.: **Measurements of the short range diffusion of airborne particles at a height of a few hundred feet in the atmosphere.** *Great Britain. Meteorological Research Committee, M.R. Paper*, No. 1006, Aug. 24, 1956. 18 p. 3 figs., 5 tables, 9 refs., 6 eqs. (*See* 8.6–248, June 1957, *MAB*)

Minnis, C. M.: **Effective recombination coefficients in the E and F1 layers.** (In: **Solar eclipses and the ionosphere: a symposium** . . . ed. by W. J. G. Beynon and G. M. Brown. London, Pergamon, 1956. p. 204–211. 4 tables, 10 eqs.) (*See* 7.11–162, Nov. 1956, *MAB*)

Miyake, Y. and Sugiura, Y.: **The radiochemical analysis of radio-nuclides in sea water collected near Bikini Atoll.** (In) **Papers in Meteorology and Geophysics,** Tokyo, 6(1):33–37, May 1955. 2 tables, 5 figs., refs. (Also reprinted again in Japan. Committee for Compilation of Report on Research in the Effects of Radioactivity: **Research in the effects and influences of nuclear bomb test explosions,** issued by the Japan Society for the Promotion of Science, Tokyo, Japan, 1956. Vol. 1:409–414.) (*For abstract on this paper from a third source, see* 7E–156, May 1956, *MAB*)

Queiroz, Dario Xavier: **Variabilidade das chuvas em Angola** [Variability of precipitation in Angola]. (In) *Agronomia Angolana*, Luanda, No. 10:57–75, 1956. 23 graphs, table, ref. French and English summaries, p. 75. (*See* 8.6–295, June 1957, *MAB*)

U. S. Weather Bureau. National Hurricane Research Project: **Objectives and basic design of the National Hurricane Research Project.** Its *Report*, No. 1, March 1956. 6 p. 3 figs., 12 refs. (*See* 8.7–182, July 1957, *MAB*)

Yamamoto, Ryozaburo: **The microbarographic oscillations produced by the explosions of hydrogen-bombs.** (In: Japan. Committee for Compilation of Report on Research in the Effects of Radioactivity, **Research in the effects and influences of the nuclear bomb test explosions.** Tokyo, 1956. Vol. 1:91–104. 7 figs., 4 tables, 7 refs. (*See* 7.2–170, Feb. 1956, *MAB*)

Routine Publications

Cameroun. Service Météorologique: **Résumé Mensuel du Temps** [Monthly resume of weather], **April 1957.** 22 p. Mostly tables. Mimeog. (*For abstract on Jan. 1954 issue, see* 6.9–86, Sept. 1955, *MAB*)

Canada. Meteorological Division: **Annual Meteorological Summary, 1956, and Long Term Meteorological Records, 1885–1956, Calgary, Alberta.** Issued 1957. 38 p. Numerous tables.

Denmark. Meteorologisk Institut: **Meteorologisk Årbog** [Meteorological yearbook], **1953, Pt.2, Greenland.** Issued Copenhagen, 1957. 52 p. (*For 1943, Pt. 2 issue, see* 3.10–43, Oct. 1952, *MAB*)

Falkland Islands. Meteorological Service: **Annual Meteorological Tables, 1954,** prepared in conjunction with the Meteorological Office, London. Pub. Falkland Islands, 1956. 137 p. Almost entirely tables. (*For 1953 issue, see* 7.3–96, March 1956, *MAB*)

Finland. Ilmatieteellinen Keskuslaitos: **Sade- ja Lumihavaintoja Suomesta** [Precipitation and snow observations in Finland], **1946.** Issued Helsinki, 1956. 70 p. Almost entirely tables. Its *Suomen Meteorologinen Vuosikirja, Pt. 2*, Vol. 46. (*For 1951 issue, see* 4.5–166, May 1953, *MAB*)

French Oceania. Service Météorologique: **Bulletins Météorologiques Mensuels de l'Année** [Monthly meteorological bulletins of the year], **1956.** Issued Papeete, Tahiti. (18 p.) Entirely tables. (*For 1950 and 1951 issues, see* 4I–226, Sept. 1953, *MAB*)

Geneva. Observatoire: **Resumé Météorologique de l'Année 1956 pour Genève** [Meteorological summary for Geneva for 1956]. Comp. by J. Ruche. Its *Publications, Ser. M, Meteorologie*, No. 31, 1957. 13 p. Almost entirely tables. (*For 1927–1936 issues and for 1951 issue, see* 2K–88, Nov. 1951 *and* 5.2–39, Feb. 1954, *MAB*)

Indonesia. Djawatan Meteorologi dan Geofisik, Djakarta: **Meteorological Data of Indonesian Aerodromes, 1951.** Pub. 1956? 199 p. Almost entirely tables. (*For 1950 issue, see* 7.10–50, Oct. 1956, *MAB*)

Italy. Ufficio Idrografico, Bari: **Annali Idrologici** [Hydrological yearbook], **1954, Pt. 1–2.** Each pub. Rome, 1957. 2 pieces. Pt. 1, 75 p. Pt. 2, 31 p. Almost entirely tables. (*For 1943, 1944 and 1945 issues, see* 7.1–303, Jan. 1956, *MAB*)

Malaya. Meteorological Service: **Summary of Observations, 1955.** Pub. 1956. 121 p. Almost entirely tables. (*For 1954 issue, see* 7.11–111, Nov. 1956, *MAB*)

C. METEOROLOGICAL ARTICLES APPEARING IN RECENTLY ISSUED PUBLICATIONS

Air Pollution Control Association, Pittsburgh, Journal, Vol. 7, No. 1, May 1957

Faith, W. L.; Goodwin, John T., Jr.; Morriss, F. V. and Bolze, Calvin: **Automobile exhaust and smog formation,** p. 9–12

Kethley, T. W.; Orr, Clyde, Jr.; Fincher, E. L. and Dallavalle, J. M.: **Airborne microorganisms as analytical tools in aerosol studies,** p. 16–20

Cohn, S. H.; Lane, W. B.; Sherwin, J. C.; Gong, J. K. and Weisbecker, L.: **The preparation and biological application of airborne simulants from nuclear detonation,** p. 20–25

Moore, G. E.; Cole, A. F. W. and Katz, Morris: **The concurrent determination of sulfur dioxide and nitrogen dioxide in the atmosphere,** p. 25–28

Jenne, D. E.: **Vertical temperature profiles in relation to other meteorological elements and to air pollution,** p. 31–35

Fisher, A. F.: **Dustfall measurements,** p. 47–50

Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz., No. 7, July 1957

Levin, L. M.: **O zabore prob aerozolia,** [On the collection of aerosol samples], p. 914–925

Sinitsyna, Z. L.: **Ob opredelenii malykh kolichestv radona i torona v ikh smesi,** [Determination of small amounts of Radon and Thoron in their mixtures], p. 950–953

Chekirda, A. Z.: **K. gidrodinamicheskoĭ teorii tsentrov deĭstviia atmosfery,** [Hydrodynamic theory on centers of atmospheric activity], p. 954–958

Zalemaev, V. S.: **O zadachakh i deiatel'nosti Konsul'tativnoĭ komissii pri Prezidiume AN SSSR po podgotovke i provedeniiu Mezhdunarodnogo geofizicheskogo goda,** [Objectives and activity of the Consulting Commission at the Presidium of the Academy of Sciences of the USSR in the preparation and conduct of the IGY], p. 965–967

No. 8, Aug. 1957

Sarkisian, A. S.: **O nestatsionarnykh vetrovykh techeniiakh v odnorodnom okeane,** [Non-stationary wind currents in a homogeneous ocean], p. 1008–1019

Kazanskiĭ, A. B. and Monin, A. S.: **O forme dymovykh struĭ,** [On the shape of smoke streams], p. 1020–1033

Novikov, E. A.: **Osazhdenie chastits aerozolia iz potoka na prepiatstvie,** [Deposition of aerosol particles from an air current onto an obstacle], p. 1034–1044

Pshenaĭ-Severin, S. V.: **O vliianii gidrodinamicheskogo vzaimodeĭstviia malykh oblachnykh kapel' na skorost' ikh padeniia,** [Influence of hydrodynamic interaction of small cloud droplets on their falling speed], p. 1045–1051

American Geophysical Union, Transactions, Vol. 38, No. 5, Oct. 1957

Brannon, H. R., Jr.; Daughtry, A. C.; Perry, D.; Whitaker, W. W. and Williams, M.: **Radiocarbon evidence on the dilution of atmospheric and oceanic carbon by carbon from fossil fuels,** p. 643–650

Henriksen, S. W.; Genatt, S. H.; Marchant, M. Q. and Batchlor, C. D.: **Surveying by occultations,** p. 651–656

McDonald, James E.: **Note on the precision of estimation of missing precipitation data,** p. 657–661

Reid, R. O. and Kajiura, K.: **On the damping of gravity waves over a permeable sea bed,** p. 662–666

Wiegel, R. L. and Kukk, J.: **Wave measurements along the California coast,** p. 667–674

Rattray, Maurice, Jr.: **On the offshore distribution of tide and tidal current,** p. 675–680

Moore, G. H. and Laird, A. D. K.: **Direct shear stresses and air velocity profiles on a mechanical wave boundary,** p. 681–687

Rutstein, Milton S.: **Flooded quarries for experimental work,** p. 688–690

Lachenbruch, Arthur H.: **Probe for measurement of thermal conductivity of frozen soils in place,** p. 691–697

Ray, William E. and Mondschein, Herman F.: **Method of forecasting stages on flat rivers,** p. 698–707

Colby, B. R.: **Relationship of unmeasured sediment discharge to mean velocity,** p. 708–717

Chang, Jen-hu: **Global distribution of the annual range in soil temperature,** p. 718–723

Raymond, J. R. and Bierschenk, W. H.: **Hydrologic investigations at Hanford,** p. 724–729

Fukuda, Hitoshi: **Underdrainage into ditches in soil overlying an impervious substratum,** p. 730–739

Roberts, W. J.: **Evaporation suppression from water surfaces,** p. 740–744

Thiel, E.; LaChapelle, E. and Behrendt, J.: **The thickness of Lemon Creek Glacier, Alaska, as determined by gravity measurements,** p. 745–749

Gutenberg, B.: **The "boundary" of the earth's inner core,** p. 750–753

Rona, Elizabeth: **A method to determine the isotopic ratio of thorium^{232} to thorium^{230} in minerals,** p. 754–759

Wiegel, R. L. and Danel, P.: **Discussion of Peter S. Eagleson: Properties of shoaling waves by theory and experiment, and reply by Eagleson,** p. 760–763

Woodring, George R.: **Discussion of Joseph L. Stearn and Earnest J. Parkin: Statistical analysis of hiran measurements, and reply by Stearn,** p. 763–764

Harrold, L. L.; Dreibelbis, F. R. et al.: **Discussion of K. M. King; C. B. Tanner and V. E. Suomi: Floating lysimeter and its evaporation recorder, and reply by King, Tanner and Suomi,** p. 765–768

Laursen, Emmett M. and Fowler, Lloyd C.: **Discussion of K. B. Schroeder and C. H. Hembree: Application of the modified Einstein procedure for computation of total sediment load, and reply by Schroeder and Hembree,** p. 768–773

Snyder, Willard M. and Kuehl, Donald W.: **Discussion of Victor A. Koelzer and Perry M. Ford: Effect of various hydro-climatic factors on snowmelt runoff, and reply by Koelzer and Ford,** p. 773–777

Munk, W. H.; Neumann, Gerhard and Pierson, Willard, J., Jr.: **Comments on a review by C. L. Bretschneider of Pierson, Neumann and James: Practical methods for observing and forecasting ocean waves by means of wave spectra and statistics,** p. 778–781

Zmuda, Alfred J.: **Use of a Taylor series as an interpolation formula with magnetic intensity values,** p. 781–782

Philip, J. R.: **Remarks on Warren A. Hall: Analytical derivation of the Darcy equation,** p. 782–784

Sherrod, John: **An IGY bibliography,** p. 784

IGY Bulletin, No. 3, Sept. 1957, p. 799–814 (for titles in this section, *see below under* IGY Bulletin)

IGY Bulletin, No. 4, Oct. 1957, p. 815–830 (for titles, *see below under* IGY Bulletin)

Annalen der Meteorologie, Vol. 8, No. 1/2, 1957

Schrödter, Harald: **Phänometrisch-statistische Untersuchungen zum Problem "Witterung und Pflanzenwachstum,"** [Phenometric-statistical investigations into the problem "Weather and plant growth"], p. 1–6

Michalowsky, Johannes: **Strahlungsbilanz und Landesverdunstung,** [Radiation balance and evaporation rate], p. 7–10

Mühleisen, Richard: **Zur Auswertung von Radiosondenmessungen der elektrischen Feldstärke und der Leitfähigkeit in der freien Atmosphäre,** [On the analysis of radiosonde measurements of the electrical field strength and conductivity in the free atmosphere], p. 11–15

Wachter, Heinz: **Zum Wirkungsgrad atmosphärischer Wärmeunwandlungen,** [On the efficiency of heat transformations in the atmosphere], p. 16–21

Koch, Horst-Günther: **Jahresringauszählungen an Waldbäumen zum Nachweis witterungsbedingter Zuwachsschwankungen,** [Counting annual rings of conifers to show growth variations due to weather conditions], p. 21–33

Volz, Friedrich: **Die spektralen Eigenschaften der Dunstsubstanz: UV-Absorption von Niederschlagswasser und der Dunsteinfluss auf die langwellige atmosphärische Strahlung,** [The spectral properties of the aerosol: UV absorption of precipitation and the influence of haze on long wave atmospheric radiation], p. 34–39

Paetzold, Hans-Karl: **Zur Analyse von atmosphärischen Transportvorgängen durch Variationen des Ozons,** [On the analysis of atmospheric transport processes by variations of ozone], p. 40–46

Kulcke, Werner and Paetzold, Hans-Karl: **Über eine Radiosonde zur Bestimmung der vertikalen Ozonverteilung,** [A radiosonde for determining the vertical distribution of ozone], p. 47–53

Paetzold, Hans-Karl and Zschörner, Helmut: **Typische Schwankungen des totalen Ozonbetrages in Weissenau,** [Typical variations of the total amount of ozone at Weissenau], p. 54–58

Dahler, Hermann: **Über die prognostische Auswertung der Radarwindmessungen,** [On the prognostic use of radar wind observations], p. 59–62

Jacobi, W.; Aurand, K. and Schraub, A.: **Über das Verhalten natürlich radioaktiver Substanzen in der Atmosphäre (Erweiterte Zusammenfassung),** [On the behavior of natural radioactive substances in the atmosphere (extended summary)], p. 63

Ciel et Terre, Brussels, Vol. 72, No. 3/4, March/April 1956

Nicolet, Marcel: **Genèse de la première Année Polaire Internationale, 1882–1883,** [Origin of the first International Polar Year, 1882–1883], p. 101–110

[Belgium. Institut Royal Météorologique]: **Eléments de météorologie, Ch. 7, Le rayonnement du soleil [by] M. Nicolet,** [Elements of meteorology, Ch. 7, Solar radiation], p. 121–150

Coutrez, Raymond: **Radioastronomie, Ch. 3, Le rayonnement Hertzien en radioastronomie,** [Radioastronomy, Ch. 3, Hertzian radiation in radioastronomy], p. 151–181

Vol. 72, No. 5/6, May/June 1956

Denisse, J. F.: **La radioastronomie et l'activité solaire,** [Radioastronomy and solar activity], p. 205–214

Piccardi, G.: **L'influence des phénomènes terrestres solaires et cosmiques sur les réactions physico-chimiques et biologiques,** [Influence of terrestrial, solar and cosmic phenomena on the physico-chemical and biological reactions], p. 227–244

Coutrez, Raymond: **Radioastronomie, Ch. 4, Lignes de transmission et aériens spéciaux utilisés en radioastronomie,** [Radioastronomie, Ch. 4, Transmission lines and special aerials utilized in radioastronomy], p. 245–280

[Belgium. Institut Royal Météorologique]: **Eléments de météorologie, Ch. 8, Les mouvements atmosphériques [by] P. Defrise,** [Elements of meteorology, Ch. 8, Atmospheric movements, by P. Defrise], p. 281–309

Vol. 72, No. 7/8, July/Aug. 1956

Dufour, L.: **Les écrivains et la météorologie: Chateaubriand,** [Writers and meteorology: Chateaubriand], p. 344–346

Doyen, Paulette: **Les expéditions antarctiques au cours de l'été australe, 1955–1956,** [Antarctic expeditions during the 1955/1956 summer], p. 347–364

[Belgium. Institut Royal Météorologique]: **Elements de météorologie, Ch. 9, Météorologie synoptique et prévisions météorologiques, [by] P. Defrise,** [Elements of meteorology Ch. 9, Synoptic meteorology and meteorological forecasting], p. 365–404

Coutrez, Raymond: **Radioastronomie, Ch. 5, Les recepteurs radioastronomiques,** [Radioastronomy, Ch. 5, Radioastronomical receivers], p. 405–436

Brouet, J. F.: **La Planète Mars au périgée,** [The Planet Mars at the perigee], p. 437–440

Lardinois, E.: **Observations phénologiques à Uccle au cours de l'année 1955,** [Phenological observations at Uccle during 1955], p. 441

Vol. 72, No. 9/10, Sept./Oct. 1956

Coutrez, Raymond: **Radioastronomie, Ch. 6, La radiation lumineuse du soleil,** [Radioastronomy, Ch. 6, Luminous radiation of the sun], p. 529–568

[Belgium. Institut Royal Météorologique]: **Eléments de Météorologie, Ch. 10, Climatologie, [by] L. Poncelet,** [Elements of meteorology, Ch. 10, Climatology], p. 569–598

Vol. 72, No. 11/12, Nov./Dec. 1956

Maenhout, A.: **Une tuba au-dessus de Gand,** [A funnel-cloud over Gand], p. 632–634

[Belgium. Institut Royal Meteorologique]: **Elements de météorologie, Ch. 10 (suite), Climatologie, [by] L. Poncelet,** [Elements of meteorology, Ch. 10 (continued), Climatology], p. 635–664

Vandenplas, A.: **La vague de froid de Février 1956 et les dégâts aux cultures,** [Cold wave of Feb. 1956 and the damage to cultivated crops], p. 665–675

Coutrez, Raymond: **Radioastronomie, Ch. 7, La radiation Hertzienne d'origine solaire,** [Radioastronomy, Ch. 7, Hertzian radiation of solar origin], p. 676–720

Vol. 73, No. 1/2, Jan./Feb. 1957

Coutrez, Raymond: **Radioastronomie, Ch. 8, Physique de la galaxie et des systèmes extragalactiques,** [Radioastronomy, Ch. 8, Physics of the galaxy and of the extragalactic systems], p. 1–43

Vol. 73, No. 3/4, March/April 1957

[Belgium. Institut Royal Météorologique]: **Éléments de météorologie, Ch. 7, Pt. 2, Les rayonnements solaire, atmosphérique et terrestre** [by] **M. Nicolet,** [Elements of meteorology, Ch. 7, Pt. 2, Solar, atmospheric and terrestrial rays], p. 113–144

Coutrez, Raymond: **Radioastronomie, Ch. 9, Radioémissions galactiques et extra-galactiques** [Radioastronomy, Ch. 9, Galactic and extra-galactic radioemissions], p. 145–190

Doyen, Paulette: **Les expéditions antarctiques au cours de l'été austral, 1956–1957,** [Antarctic expeditions during the southern summer, 1956–1957], p. 191–210

Dufour, Louis: **Les écrivains et la météorologie: René Boylesvé,** p. 211–213

Vol. 73, No. 5/6, May/June 1957

Viaut, A.: **Conditions météorologiques aux hautes altitudes et assistance météorologique aux aéronefs à hautes performances,** [Meteorological conditions of the upper altitudes and meteorological assistance to high-speed aircraft], p. 237–256

Coutrez, Raymond: **Radioastronomie, Ch. 10, Ondes radioélectriques et échos d'origine planetaire et météorique,** [Radioastronomy, Ch. 10, Radioelectric waves and echoes of planetary and meteoric origin], p. 279–335

Vol. 73, No. 7/8, July/Aug. 1957

Dufour, L.: **Les écrivains et la météorologie: Gérard de Nerval,** [Writers and meteorology: Gerard de Nerval], p. 387–388

L'Expédition Antarctique Belge 1957/1958: Programme scientifique, [The Belgian Antarctic Expedition, 1957/1958: Scientific program], p. 389–399

IGY Bulletin, Wash., D. C., No. 3, Sept. 1957 (This **Bulletin,** issued by the National Academy of Sciences, appears as a section of the **American Geophysical Union, Transactions,** 38(5):799–814, Oct. 1957)

Status report: the Upper atmosphere program, p. 799 (i.e., p. 1 of the Reprint issue)
Solar activity program, p. 800–801 (i.e., p. 2–3)
Cosmic ray program, p. 801–805 (i.e., 3–7)
Geomagnetism program, p. 805–808 (i.e., 7–10)
Ionospheric physics program, p. 808–810 (i.e., 10–12)
Aurora and airglow program, p. 811–812 (i.e., 13–14)
Rocket program, p. 812–814 (i.e., p. 14–16)

No. 4, Oct. 1957 (This issue appears as **AGU Transactions,** 38(5):815–830, Oct. 1957)

Current sunspot numbers, p. 815–817 (i.e., p. 1–3 of Reprint issue)
The IGY research rocket program, p. 818–821 (i.e., 5–7)
IGY antarctic weather central, p. 821–824 (i.e., 8–10)
Arctic program, p. 824–830 (i.e., 10–16)

International Symposium on Man's Role in Changing the Face of the Earth, Princeton, N. J., June 16–22, 1955, [Proceedings], ed. by William L. Thomas, Jr. Published for the Wenner Gren Foundation for Anthropological Research and the National Science Foundation by the Univ. of Chicago Press, 1956.

Wissmann, Hermann von; Poech, H.; Smolla, G. and Kussmaul, F.: **On the role of nature and man in changing the face of the dry belt of Asia,** p. 278–303

Huzayyin, Soliman: **Changes in climate, vegetation, and human adjustment in the Saharo-Arabian belt with special reference to Africa,** p. 304–323

Thomas, Harold E.: **Changes in quantities and qualities of ground and surface waters,** p. 542–563

Thornthwaite, Charles W.: **Modification of rural microclimates,** p. 567–583

Landsberg, Helmut E.: **The climate of towns,** p. 584–606

Schaefer, Vincent J.: **Artificially induced precipitation and its potentialities,** p. 607–618

Journal of Geomagnetism and Geoelectricity, Tokyo, Vol. 7, No. 4, Dec. 1955

Maeda, Hiroshi: **Horizontal wind systems in the ionospheric E region deduced from the dynamo theory of the geomagnetic *Sq* variation, Pt. 1, Non-rotating earth,** p. 121–132

Vol. 8, No. 1, March 1956

Hokkyo, Noboru: **Scattering of electromagnetic waves by plasma oscillations,** p. 1–8
Hirono, Motokazu and Kitamure, Tai-ichi: **A dynamo theory in the ionosphere,** p. 9–23
Kato, Susumu: **Horizontal wind systems in the ionospheric E region deduced from the dynamo theory of the geomagnetic *Sq* variation, Pt. 2, Rotating earth,** p. 24–37

Vol. 8, No. 2, June 1956

Kodama, Masahiro and Murakami, Kazuaki: **Observation of cosmic-ray neutron intensity at geomagnetic latitude 25°N, Pt. 2, 27-day recurrence tendency and solar activity,** p. 71–75
Ota, Masaziro and Hashizume, Shoichiro: **Geomagnetic variation due to the solar eclipse of June 20, 1955,** p. 76–80
Namikawa, Tomikazu: **Instability of a layer of fluid heated below and subject to the simultaneous action of a magnetic field and rotation,** p. 80–85

Vol. 8, No. 3, Sept. 1956

Yagi, Teiichiro: **Intensity problem in the deflection of cosmic rays in the solar magnetic field,** p. 87–92
Yagi, Teiichiro and Ueno, Hiroyuki: **Diurnal variation of vertical cosmic rays: narrow total and high energy components,** p. 93–107

Vol. 8, No. 4, Dec. 1956

Sato, Teruo: **Disturbances in the ionospheric *F2* region associated with geomagnetic storms, Pt. 1, Equatorial zone,** p. 129–135
Isikawa, Haruzi: **Lightning mechanism and atmospherics radiation,** p. 136–146
Asami, Eizo: **A palaeomagnetic consideration on the remanent magnetism of the basalt lavas at Kawajiri-misaki, Japan,** p. 157–155
Matsushita, Sadami: **Relations among radio absorbing regions, geomagnetic bay-disturbances and slant-*Es* in auroral latitudes,** p. 156–160

Vol. 9, No. 1, March 1957

Sato, Teruo: **Disturbances in the ionospheric F2 region associated with geomagnetic storms, Pt. 2, Middle latitudes,** p. 1–22
Nagata, T.; Akimoto, S. et al.: **Palaeomagnetic studies on a quaternary volcanic region in Japan,** p. 23–41
Nagata, Takesi and Rikitake, Tsuneji: **Geomagnetic secular variation during the period from 1950–1955,** p. 42–50
Sato, Teruo: **Disturbances in the *F1* and *E* regions of the ionosphere associated with geomagnetic storms,** p. 57–60

Journal of Glaciology, Vol. 3, No. 22, Oct. 1957

Seddon, Brian: **Late-glacial cwm glaciers in Wales,** p. 94–99
Armstrong, Terence: **The ice of the central polar basin,** p. 105–110
Browne, W. R.: **Pleistocene glaciation in the Commonwealth of Australia,** p. 111–115
Muller, Ernest H. and Coulter, Henry W.: **The Knife Creek glaciers of Katmai National Monument, Alaska,** p. 116–122
Miller, Don J.: **The surface velocity of the Yakataga Glacier, Alaska,** p. 125–130
Brown, R. J. E.: **Observations on break-up in the Mackenzie River and its delta in 1954,** p. 133–140

Journal of Meteorological Research, Tokyo, Vol. 9, No. 6, July 1957

Nakada, Y.: **Relationship between the rice crop and climatic factors in Niigata Prefecture,** p. 379–393
Terauchi, E.: **Some researches on the graphical methods of forecasting, Pt. 1,** p. 394–399

Suzuki, E.: **Statistical study on the amount of precipitation, Pt. 9, Order statistic and its application,** p. 400–406
Uwai, K.: **On the structure of atmospheric disturbances at initial stage in low latitudes (On atmospheric disturbances in low latitudes, Pt. 2),** p. 407–412
Mitomo, S.: **Relationship between the variation of total momentum over the Northern Hemisphere and the weather in Japan,** p. 413–415
Yasuda, K.: **A case study of showers associated with a cold front,** p. 416–421
Kato, H.; Naito, W. and Mitsubayashi, T.: **Changes of air temperature (Climatic changes in Takai District, Pt. 1),** p. 422–426
Masatsuka, A. and Yonekubo, Y.: **On the geographical distribution of minimum air temperature in the late frosty dawn in Nagano Prefecture,** p. 427–430
Tazawa, K.: **On the eruption of Mihara volcano and volcanic earthquakes in Izu Oshima Island, Pt. 2,** p. 421–435
Shimakawa, K.: **Observation of atmospherics associated with thunderstorm and its application to weather forecasting,** p. 436–440
Japan. Meteorological Training School: **Harmonic coefficients of the annual variation of pressure over the Far East,** p. 441–448
Watanabe, T.: **[Comments on] J. G. Charney and A. Eliassen: A numerical method for predicting the perturbations of the middle latitude Westerlies,** p. 449–450 (*See* 5F–21, June 1954, *MAB*)
Kamiko, T.: **[Comments on] M. Ando: General circulation observed from the variations of the mass of air over the Northern Hemisphere, Pt. 2,** and reply by Ando, p. 451–452
Neyama, Y.: **[Comments on] K. Fukuhara: Climatological study on the Bai-u, Pt. 1,** and reply by Fukuhara, p. 452–454

Vol. 9, No. 7, July 1957

Kusakabe, M.: **Water balance at Fukuoka,** p. 455–462
Sugimoto, Y.: **Fluctuation of jet stream in the Far Eastern Asia,** p. 463–466
Uwai, K.: **Generation of pressure trough and formation of low (On atmospheric disturbance in low latitudes, Pt. 3),** p. 467–474
Tomioka, S.: **A statistical study on the long wave over the Far East,** p. 475–479
Nabeshima, Y.: **On the simplified method of Fjørtoft's model for forecasting the 1000 mb surface map,** p. 480–484
Kasuya, M. (comp.): **On the rapid development of a cyclone over the sea off the East Coast of Kanto on 25th to 26th December 1955,** p. 485–498
Kujirai, K. (comp.): **On the decay of the cyclone of May 22–23, 1956 in the East China Sea and the subsequent unsettled weather,** p. 499–502
Kujirai, K. (comp.): **On the change of weather on September 22–23, 1956,** p. 503–507
Otsuka, R. (comp.): **On the local heavy rain associated with the thunderstorm of July 22, 1955,** p. 508–512
Arai, T.: **On the local heavy rain associated with the thunderstorm of July 22, 1955,** p. 513–518
Otsuka, R.: **A case study of the practical application of radar echoes to the forecasting of local heavy rain associated with thunderstorm,** p. 519–523
Tomitaka, S.: **Statistical study on clouds at Fukuoka,** p. 524–528
Saito, R.: **Probability of occurrence of high wind speed (High gales of Japan, Pt. 2),** p. 529–532
Fujita, M.: **Statistical studies on the upper winds at Tomie,** p. 533–535
Tabata, S.: **A simple method for calculating D.D.A. values,** p. 536
Hanayama, T.: **On the local weather associated with the north-easterly wind in the northern part of the eastern coast of Izu Peninsula,** p. 537–539
Ono, Y.: **A numerical experiment on a Wiechert seismometer,** p. 540–541
Saito, H.: **[Comments on] K. Akai: Meteorological study on heating and forecasting of room-temperature,** p. 542

Vol. 9, No. 6, Aug. 1957

Fukuoka District, Japan. Central Meteorological Observatory: **Hydrometeorological studies of the River Chikugo,** p. 546–559
Kikuchi, T.: **The advection of jetstream core and the heavy rainfall,** p. 560–565
Uwai, K.: **Periodic variation of 1 to 2 days in typhoon appearing both in the pressure change at the center and in the upper air situation over the central region (On atmospheric disturbance in low latitudes, Pt. 4),** p. 566–569
Miyazawa, S.: **On the occurrence time of intense rain and snowfall in Nagano District,** p. 570–574
Sapporo District, Japan. Central Meteorological Observatory: **On the lower temperature inversion layer and the curvature of microwave propagation at Sapporo,** p. 575–582

Ueki, K.: **Forecasting of monsoon outbreak over the Far East by 500 mb weather typing,** p. 583–595
Kojima, T.: **Relationship between the various annual mean wind velocities and the frequency distribution of wind velocities,** p. 596–599
Kurebayashi, H.: **On the earthquake at Nagasaki,** p. 600–601
Shinagawa, S.: **Statistical researches on the dates of first frost and last frost in Kagoshima prefecture,** p. 602–604
Kuribayashi, N.: **On the bai-u at Naze,** p. 605–606
Kamijo, K. and Eta, S.: **Bai-u (rainy season) at Kagoshima, Japan,** p. 607–608
Sugii, A.: **Application of matrix as an operator to meteorology,** p. 609–610
Hirasawa, K.: **[Comments on] T. Sasaki: On the early visited drift ice [and] Reply by Sasaki,** p. 611–612
Kikuchihara, H.: **[Comments on] E. Suzuki: Statistical analysis for the mechanism of yearly amount of precipitation [and on] On secular trends of yearly amount of precipitation caused by typhoon and bai-u, [and] Reply by Suzuki,** p. 612–613

Journal of Meteorology, [Boston], Vol. 14, No. 5, Oct. 1957

Schotland, R. M.: **The collision efficiency of cloud drops of equal size,** p. 381–385
Kasahara, Akira: **The numerical prediction of hurricane movement with the barotropic model,** p. 386–402
Palmer, Clarence E.: **Some kinematic aspects of frontal zones,** p. 403–409
Gifford, Frank, Jr.: **Relative atmospheric diffusion of smoke puffs,** p. 410–414
Hosler, Charles L.; Jensen, D. C. and Goldshlak, L.: **On the aggregation of ice crystals to form snow,** p. 415–420
Edinger, J. G. and Rapp, R. R.: **Dispersion in the upper atmosphere,** p. 421–425
Reynolds, S. E.; Brook, M. and Gourley, Mary Foulks: **Thunderstorm charge separation,** p. 426–436
Woodcock, A. H. and Spencer, A. T.: **An airborne flame photometer and its use in the scanning of marine atmospheres for sea-salt particles,** p. 437–447
White, Robert M.; Derby, Royce C.; Cooley, Duane S. and Seaver, Florence A.: **Hemispherical prediction by statistical techniques,** p. 448–457
Staley, D. O.: **The low-level sea breeze of northwest Washington,** p. 458–470
Buell, C. Eugene: **Synoptic scale motion of the atmosphere as two dimensional isotropic turbulence,** p. 471–472
Anderson, Albert D.: **[Comments on] H. J. aufm Kampe: Upper-air wind measurements with small rocket [and] Reply by aufm Kampe,** p. 473–474
Alpert, Leo: **[Comments on] Ross Gunn: Initial electrification processes in thunderstorms,** p. 474–475
Gifford, Frank, Jr.: **Further data on relative atmospheric diffusion,** p. 475–476
Lowenthal, Marvin: **Abnormal mid-stratospheric temperatures,** p. 476

Meteorological Magazine, London, Vol. 86, No. 1024, Oct. 1957

Meade, P. J.: **Atomic energy and the meteorologist,** p. 289–296
Bartrum, P. C.: **Diurnal variation of surface wind and pressure at Bermuda,** p. 296–301
Lawrence, E. N.: **Estimation of the frequency of "runs of dry days,"** Pt. 2, p. 301–304
Frankcom, C. E. N.: **British ocean weather ships—10th anniversary,** p. 304–306
Willis, A. J.: **Helicopters and the forecasters,** p. 306–308

Meteorologiia i Gidrologiia, Leningrad, No. 3, March 1957

Uryvaev, V. A.: **O resursakh poverkhnostnykh vod severnykh oblasteĭ Kazakhstana,** [Surface water resources of the northern regions of Kazakhstan], p. 3–14
Razumova, L. A. and Mel'nik, Iu. S.: **Usloviia vodosnabzheniia iarovoĭ pshenitsy pri osnovnykh sposobakh ee vozdelyvaniia v stepnykh raĭonakh Kazakhstana,** [Water-supply conditions of summer wheat with the principal methods of raising it in the steppe regions of Kazakhstan], p. 15–24
Gol'tsberg, I. A.: **Izuchenie mikroklimata Kazakhstanskogo melkosopochnika,** [Study of the microclimate of the Kazakhstan hillocks], p. 25–34
Grishin, N. I.: **Izuchenie dvizheniĭ serebristykh oblakov metodom kinos"emki,** [Investigation of the movement of noctilucent clouds by a cinematographic method], p. 34–37

Gogishvili, K. S.: **O nekotorykh osobennostiakh atmosfernykh protsessov, prepiatstvuiushchikh proniknovaniiu kholodnogo vozdukha na iug Kavkaza,** [Some special features of atmospheric processes preventing the penetration of cold air to the southern Caucasus], p. 37–40

Fedoseev, A. P.: **Ispol'zovanie pokazatelia glubiny promachivaniia pochvy vesnoi v kachestve prognosticheskogo priznaka,** [Use of a soil saturation depth index in spring as a forecasting characteristic], p. 40–44

Trushin, V. F.: **Rezhim taianiia snega i intensivnost' vesennego zhidkogo stoka pri sploshnom pokrytii snega poroshkom,** [Snow-melt regime and rate of spring water run-off after uniform covering of the snow with black dust], p. 44–45

Sokolov, I. F.: **Pyl'naia buria v Primor'e,** [Dust storm in Primor'e], p. 45–46

Kharshan, Sh. A.: **K metodike prognoza talogo stoka gornykh rek,** [Method of forecasting melt runoff in mountain rivers], p. 46–51

Khobta, P. M.: **O nekotorykh ledovykh obrazovaniiakh na pritokakh r. Kubani,** [Some ice formations on tributaries of the Kuban River], p. 51

Kritskii, S. N. and Menkel', M. F.: **K voprosu ob otsenke veroiatnoi povtoriaemosti gidrologicheskikh velichin,** [Problem of determining the probability of recurrence of hydrological values], p. 52–53

Nartysh, N. A.: **Gidrometeorologicheskoe obsluzhivanie stroitel'stva Stalingradskoi gidroelektrostantsii,** [Hydrometeorological service during construction of the Stalingrad hydroelectric station], p. 54–56

Dvizin, V. A.: **Sostavlenie prognozov urovnei vody v period napolneniia Kakhovskogo vodokhranilishcha,** [Preparation of water-level forecasts during the recharge period of the Kakhovsk drainage basin], p. 56–57

Krasheninnikov, M. V.: **Iz opyta raboty gidrometeostantsii Napas,** [Experience with the Napas hydrometeorological station], p. 57

Rakhmanov, V. V. and Sapozhnikov, V. I.: **O vizual'nom opredelenii pokrytosti basseinov snegom pri aviarazvedkakh vo vremia snegotaianiia,** [Visual determination of the amount of snow cover in catchment areas by aerial reconnaissance during the melting period], p. 58–59

Davitaia, F. F.: **Meteorologicheskaia sluzhba Brazilii,** [Meteorological Service of Brazil], p. 60–63

Moroz, A. A. and Kutoboi, A. M.: **[Review of] Rukovodstvo dlia agrometeorologicheskikh postov MTS kolkhozov i sovkhozov, published Leningrad, Gidrometizdat, 1955,** [Handbook for agrometeorological stations of meteorological stations at collective farms], p. 64–65

Orlov, V. M. and Zavalishin, V. A.: **O nedostatkakh agrometeorologicheskikh rukovodstv i instruktsii,** [Deficiencies in agricultural meteorology manuals and instructions], p. 65–66

Zigun, V. P.: **Vazhnyi shag v razvitii sovetsko-mongol'skogo sotrudnichestva v oblasti gidrometeorologii,** [An important step in the development of Soviet-Mongolian collaboration in the field of hydrometeorology], p. 67

Zakharov, V. N.: **Soveshchanie v Kazakhstane,** [Meeting in Kazakhstan], p. 67–68

O sozyve III Vsesoiuznogo gidrologicheskogo s"ezda, [Summoning of the Third All-Union Hydrological Congress], p. 68

No. 4, April 1957

Mazin, I. P.: **Ob obledenenii skorostnykh samoletov,** [Icing of high speed aircraft], p. 308

Parshin, V. N. and Salov, M. S.: **K probleme prognoza godovogo stoka krupnykh rek,** [Problem of forecasting annual runoff in large rivers], p. 9–14

Muromtsev, A. M.: **Novye karty raspredeleniia solenosti i plotnosti na poverkhnosti Tikhogo okeana,** [New charts of the salinity and density distribution on the surface of the Pacific Ocean], p. 15–19

Kalmykova, N. M.: **O formirovanii sibirskogo antitsiklona,** [On the formation of the Siberian anticyclone], p. 20–24

Usmanov, R. F.: **Vertikal'nyi razrez atmosfery nad Indiiskim okeanom,** [Vertical cross section of the atmosphere over the Indian Ocean], p. 24–28

Shpak, I. S. and Murzin, L. P.: **Shkval v raione Tsimlianskogo vodokhranilishcha 25 iiunia 1956 g.,** [Squall in the Tsimilansk watershed region on June 25, 1956], p. 28–30

Savzdarg, S. F.: **O viliianii vlagi na formirovanie pochatka kukuruzy,** [Influence of moisture on the formation of ears of corn], p. 31–32

Evstigneev, A. S. and Popov, A. N.: **Ob isparenii s vodnoi poverkhnosti, porossheĭ rastitel'nost'iu,** [Evaporation from water surfaces overgrown with vegetation], p. 32–34

Kubyshkin, G. P.: **O vertikal'noi zonal'nosti raspredeleniia godovogo stoka rek Zakarpat'ia** [Vertical zonal distribution of annual runoff in the Transcarpatian rivers], p. 34–35

Gandin, L. S. and Dubov, A. S.: **K voprosu o kachestvennom analize uravneniia vikhria,** [Problem of the qualitative analysis of the equations of vorticity], p. 36–37

Leonov, M. P.: **O sinoptiko-aerologicheskom issledovanii atmosfernykh frontov,** [The synoptic-aerological investigation of fronts], p. 37–40

Nichkevich, S. N. and Blagoveshchenskiĭ, P. P.: **Rabota gidrometeorologicheskoĭ stantsii Rostov (Iaroslavskoĭ obl.),** [Work of the Rostov (Iaroslavl Oblast) Hydrometeorological Station], p. 41–44

Surazhskiĭ, D. Ia.: **Novyĭ anemorumbometr (M-38),** [New M-38 anemorhumbometer], p. 45–47

Nikitin, I. S.: **Radiolokatsionnyĭ metod izucheniia morskikh techeniĭ,** [Radiolocation method of investigating ocean currents], p. 47–50

Shul'gin, V. M.: **Ob aktinometricheskoĭ shkale,** [The actinometric scale], p. 51–55

Lisachenko, F. P.: **Uluchshim kachestvo uchebnikov dlia tekhnikumov,** [Improvement of the quality of textbooks for technical schools], p. 56–58

Sinel'shchikov, V. V.: **Soveshchanie aktiva rabotnikov gidrometsluzhby Kazakhstana,** [Conference of workers in the hydrometeorological service of Kazakstan], p. 63

Nauchnaia sessiia v selenii Khutsubani, [Scientific session at the city of Khutzuban], p. 64

No. 5, May 1957

Zubian, G. D.: **Issledovanie prostranstvennoĭ modeli fronta, okhvatyvaiushcheĭ vsiu troposferu i nizhniuiu stratosferu,** [Investigations on a spatial frontal model, including the whole troposphere and the lower stratosphere], p. 3–11

Kalinin, G. P. and Abal'ian, T. S.: **Ob opredelenii podzemnogo pitaniia rek,** [Determination of the underground alimentation of rivers], p. 12–20

Muromtsev, A. M.: **Okeanograficheskaia izuchennost' Tikhogo okeana,** [State of knowledge on the oceanography of the Pacific Ocean], p. 21–25

Sokolov, P. A.: **O meteorologicheskom obsluzhivanii grazhdanskogo vozdushnogo flota,** [Meteorological service to civil aviation], p. 26–28

Peryshkin, I. N.: **Smerch v Belorussii,** [Tornado in White Russia], p. 29–30

Glebova, M. Ia.: **Osobennosti fitoklimata na poliakh osushennogo bolota,** [Characteristics of the phytoclimate of drained marches], p. 30–34

Savchenkova, E. I.: **Ispol'zovanie indeksa atmosfernoĭ tsirkuliatsii dlia razrabotki dolgosrochnogo prognoza srokov vskrytiia rek,** [The use of the index of atmospheric circulation in long-range forecasting of river breakup], p. 34–37

Grishin, I. S.: **Vliianie meteleĭ na akkumuliatsiiu snega v ovrazhnobalochnoĭ seti basseĭna r. Dona,** [The influence of blizzards on snow accumulation in the gullies and ravines of the Don River basin], p. 37–40

Simonov, A. I.: **O rezhime vzveseĭ na vzmor'e Kubani,** [On the regime of suspended matter in the Kuban Gulf], p. 40–42

Mironova, N. Ia.: **O stoke v zaliv Kara-Bogaz-Gol,** [Discharge into the Kara-Bogaz-Gol Bay], p. 42

Lavrov, V. V.: **K vorposu obrazovaniia vnutrivodnogo l'da,** [Formation of underwater ice], p. 43–45

Goptarev, N. P.: **O nekotorykh kharakteristikakh poryvistosti vetra,** [Some characteristics of gustiness], p. 45–49

Rudnev, G. V.: **Uchastniki Vsesoiuznoĭ sel'skokhoziaĭstvennoĭ vystavki 1956 goda,** [Participants of the All-Union Agricultural Exposition of 1956 goda], p. 50–51

Kovalenko, V. P.: **Agrometeorologicheskoe obsluzhivanie sel'skogo khoziaĭstva Uzbekskoĭ SSR,** [Agrometeorological service for agriculture in the Uzbek SSR], p. 51–53

Oksenich, I. G.: **Uporiadochit' delo s sertifikatami na pribory,** [Regulating instrument certificates], p. 53

Ponomarev, V. I.: **Nekotorye uluchsheniia raboty pliuviografov sistemy Gel'mana,** [Improvements on the Hellmann type pluviograph], p. 54–56

Meshcherskiĭ, V. I.: **Priviaznye poplavki s osveshcheniem,** [Anchored buoys with lights], p. 56

Bagrov, N. A.: **Dolgosrochnye prognozy pogody za rubezhom,** [Long-range forecasts in foreign countries], p. 57–62

Kondrat'ev, K. Ia.: [**Review of**] **M. I. Budyko: Teplovoĭ balans zemnoĭ poverkhnosti,** [Thermal regime of the ground surface], p. 63–64

Muchnik, V. M.: [**Review of**] **V. A. Fedoseeva and A. I. Polianskiĭ: Opyt primeneniia krutil'nykh vesov k izmereniiu malykh sil pri vzaimodeĭstvii kapel',** [Experiment on the use of a rotating balance for measuring the small forces of interaction between drops], p. 65

Ulanova, E. S.: **25 let deiatel'nosti po agrometeorologicheskomu obsluzhivaniiu sel'skogo khoziaĭstva,** [25 years of agrometeorological activity in the service of agriculture], p. 66–67

Gavrilenko, N. M.: **O koordinatsii nauchno-issledovatelskikh rabot,** [Coordination of scientific research work], p. 67
Sinel'shchikov, V. V.: **Konferentsiia chitateleĭ zhurnala "Meteorologiia i Gidrologiia" v Alma-Ate,** [Conference of "Meteorologiia i Gidrologiia" readers at Alma-Ata], p. 67

No. 6, June 1957

Tauber, G. M.: **Aerometeorologicheskie issledovaniia v Antarktide I Sovetskoĭ antarkticheskoĭ ekspeditsii 1955–1957 gg,** [Aerometeorological investigations in the Antarctic and Soviet Antarctic Expeditions], p. 3–11
Popova, T. P.: **Osobennosti teplykh frontov nad Evropeĭskoĭ territorieĭ SSSR zimoĭ,** [Peculiarities of warm fronts over European USSR in winter], p. 12–20
Kulik, M. S.: **Uchet uvlazhneniie sel'skokhoziaĭstvennykh poleĭ,** [Calculation of moisture of cultivated fields], p. 20–25
Gushchin, G. P.: **K voprosu ob izmerenii obshchego soderzhaniia atmosfernogo ozona i ego vertikal'nogo raspredeleniia,** [Measurement of the general content of atmospheric ozone and its vertical distribution], p. 26–32
Kolobkov, N. V.: **Smerch pod Moskvoĭ,** [Tornado over Moscow], p. 32–33
Chernoivanenko, I. M.: **Raschet urovneĭ r. dona na zaregulirovannom uchastke,** [Calculation of the levels of the Don in controlled sectors], p. 34–35
Selitskaia, E. S.: **K voprosu o vnutrennikh volnakh,** [On internal waves], p. 35–39
Alekseev, G. A.: **O metodakh rascheta maksimal'nykh raskhodov i gidrografov navodkov pri otsutstvii nabliudeniĭ,** [Methods of calculating maximum runoff and flood hydrographs in the absence of observations], p. 40–45
Tsyganov, G. P.: **Opyt meteorologicheskogo obslyzhivaniia raĭonnoĭ dispetcherksoĭ sluzhby i ispol'zovaniia radiolokatsionnoĭ stantsii RUPOR na AMSG Rostov-na-Donu,** [Experiments with a meteorological service for a regional dispatching service and the use of radar stations RUPOR on AMSG at Rostov on the Don], p. 46–47
Pikush, N. V.: **Primenenie sukhoĭ soli dlia opredeleniia raskhodov vody metodom smesheniia,** [Application of dry salts for determining runoff of water by the mixing method], p. 47–48
Shcherbakova, L. F.: **Diffuzionnyĭ gigrometr,** [Diffusion hygrometer], p. 49–52
Rakipova, L. R.: **Vliianie atomnykh vzryvov na atmosferu,** [Influence of atomic explosions on the atmosphere], p. 53–57
Nakorenko, N. F.: **[Review of] I. G. Guterman; S. I. Dunaeva and L. V. Mamaeva: O primenmosti metoda raznosteĭ pri aeroklimaticheskoĭ obrabotke vetra (Pub. in Trudy, No. 2, 1955 of Ts.N.I.G.M.A.,** [Application of method of differences in working up climatic data on winds aloft], p. 58–59
[Obituary notice of] Andreĭ Andreevich Trufanov, p. 62–63
Krichak, O. G.: **V antarktide,** [In the Antarctic], p. 63–64
Pogvinov, K. T.: **Mezhdunarodnoe soveshchanie po voprosam gidrometeorologii,** [International conference on hydrometeorological problems], p. 64–65

No. 7, July 1957

Pogosian, Kh. P.: **Vysotnye frontal'nye zony i struĭnye techeniia v atmosfere,** [High frontal zones and jet streams in the atmosphere], p. 3–11
Shishkov, V. G.: **O nektorykh zakonomernostiakh v razvitii atmosfernykh protsessov,** [On several regularities in the development of atmospheric processes], p. 12–16
Kuznetsov, V. I.: **Ob izmeneniiakh stoka r. Syr-Dar'i v sviazi s razvitiem orosheniia,** [Fluctuations in the runoff of the Syr-Darya River as related to the development of irrigation], p. 17–21
Klinov, F. Ia.: **Sviazannaia kristallizatsiia vodianykh parov atmosfery,** [Crystallization of atmospheric water vapor on objects], p. 22–25
Burtsev, A. I.: **Ob uchete izmeneniia vertikal'noĭ skorosti s vysotoĭ pri raschete adiabaticheskikh izmeneniĭ temperatury,** [Computing changes in vertical speed with height in the calculation of adiabatic temperature changes], p. 26–30
Orlenko, L. R.: **O zavisimosti potoka tepla v pochvu ot temperatury poverkhnosti pochvy,** [The dependence of heat loss in the ground on the surface temperature of the soil], p. 30–32
Buchinskiĭ, I. E.: **Vekovoĭ khod sukhoveev v Voroshilovgrade,** [The secular march of dry periods in Voroshilovgrad], p. 32–33
Chirkov, Iu. I.: **Znachenie ucheta listoobrazovaniia kukuruzy v agreometeoobsluzhivanii,** [The importance in agrometeorological service of calculating leaf formation in corn], p. 33–37
Korobkov, I. M.: **Ob izmerenii dliny rek,** [Measuring the length of rivers], p. 38–39

Nezhikovskiĭ, R. A.: **K voprosu o sostavlenii gidrologicheskikh prognozov dlia neizuchennykh rek,** [The preparation of hydrologic forecasts for insufficiently studied rivers], p. 39–40

Skriptunova, L. I.: **O roli teplovogo balansa poverkhnosti v rezhime temperatury vody v severnoĭ chasti Atlanticheskogo okeana,** [The role of surface heat balance in the temperature regime of the waters of the northern Atlantic Ocean], p. 40–45

Lavrishchev, D. N.: **Obrabotka nabliudenii nad nizkoĭ oblachnost'iu s tsel'iu ispol'zovaniia ikh dlia prognoza,** [The treatment of low-cloud observations with their full utilization in the forecast], p. 46–47

Sukhov, I. M.: **Opyt obsluzhivaniia sel'skokhoziaĭstvennoĭ aviatsii,** [Experience in providing service for agricultural aviation], p. 47–48

Elovskikh, M. P. and Kondrat'ev, K. Ia.: **Radiometr dlia izmereniia intensivnosti teplovogo izlucheniia atmosfery i sravnenie ego s pirgeometrom,** [Radiameter for measuring the intensity of atmospheric heat radiation and its comparison with the pyrgeometer], p. 49–51

Ponomarenko, I. N.: **Gidrometeorologicheskaia sluzhba v Narodnoĭ Respublike Albanii,** [Hydrometeorological service in the Peoples Republic of Albania], p. 52–53

Leonov, M. P.: [**Review of**] **O. G. Krichak: Sinopticheskaia meteorologiia,** [Synoptic meteorology], p. 54–56

Sheĭnis, I. M.: **O referativnom zhurnale,** [On the Referativnyi Zhurnal [Abstract Journal]], p. 56–57

Meteorologische Rundschau, Berlin, Vol. 10, No. 4, July/Aug. 1957

Dammann, W.: **Zum Problem rezenter Klimaschwankungen in Westdeutschland und ihres möglichen Zusammenhanges mit der Sonnenfleckenwelle,** [Problem of recent climatic oscillations in West Germany and their possible connection with the sunspot wave], p. 113–119

Essenwanger, Oskar and Holzapfel, Rupert: **Versuch einer Deutung der Luftbewegung über Mitteleuropa,** [Search for a meaning of the air movement over Central Europe], p. 119–124

Haude, Waldemar: **Über nutzlose Evaporation verschiedener Böden in einem Trockenklima,** [Needless evaporation from different soils in a dry climate], p. 124–127

Gressel, Walter: **Zur Abhängigkeit des myocardinfarktes vom Wettergeschehen,** [Dependence of myocardiac infarct on weather], p. 128–129

Schnelle, F. and Volkert, E.: **Vorschläge zur Einrichtung "Internationaler Phänologischer Gärten" als Stationen eines Grundnetzes für internationale phänologische Beobachtungen,** [Proposal for "International Phenological Gardens" as stations of a network of phenological observations], p. 130–133

Morgen, A.: **Zur Frage des Wasserbedarfs bei der Frostschutzberegnung,** [Water need in frost protection sprinkling], p. 133–135

Morgen, A.: **Zur künstlichen Wärmesteuerung im Wurzelraum der Pflanzen,** [Artificial warming in root space of plants], p. 135–139

Moscow. Tsentral'naia Aerologicheskaia Observatoriia, Trudy, No. 16, 1956

Reshetov, V. D.: **Obosnovanie metodiki vyderzhek radiozondov,** [The basis of the method of exposing radiosondes], p. 3–9

Zaĭchikov, P. F.: **Metod troĭnogo kontrolia i ego primenenie dlia issledovaniia tochnosti radiozondov,** [The method of triple control and its use in investigating the accuracy of radiosondes], p. 10–17

Kastrov, V. G. and Farapanova, G. P.: **Radiatsionnye oshibki platinovogo termometra soprotivleniia,** [Radiation errors of the platinum resistance thermometer], p. 18–20

Pokrovskiĭ, V. N.: **K metodike vychisleniia vertikal'nogo raspredeleniia ozona v atmosfere,** [On a method of figuring the vertical distribution of ozone in the atmosphere], p. 21–25

Kastrov, V. G.: **Solnechnaia radiatsiia v troposfere v sluchae absoliutno chistogo i sukhogo vozdukha,** [Solar radiation in the troposphere in the case of absolutely clear and dry air], p. 26–30

L'vova, E. M.: **Izmereniia summarnoĭ radiatsii solntsa i al'bedo zemli do vysoty 10–20 km,** [Measuring total solar radiation and albedo of the earth to heights of 10–20 km], p. 31–38

Krechmer, S. I **Eksperimental'noe opredelenie kharakteristik temperaturnykh pul'satsiĭ v atmosfere,** [Experimental determination of temperature characteristics of pulsation in the atmosphere], p. 16–39

Kaminer, N. C.: **Sutochnyĭ khod temperatury v svobodnoĭ atmosfere,** [Daily march of temperature in the free atmosphere], p. 48–51

eshetov, V. D.: **Ob izmerenii dal'nosti radiopilotov,** [Measurement of distance of radiopilots], p. 52–58

No. 17, 1956

Britaev, A. S.: **Nestatsionarnoe temperaturnoe pole kapli zhidkosti,** [Unstable temperature field of a drop of liquid], p. 1–14

Minervin, V. E.: **Ob izmereniiakh vodnosti i obledeneniia v pereokhlazhdennykh oblakakh i o nekotorykh oshibkakh etikh izmerenii,** [The measurement of water content and icing in supercooled clouds and some errors of these measurements], p. 15–35

Khrgian, A. Kh. and Mazin, I. P.: **Analiz sposobov kharakteristiki spektrov raspredeleniia oblachnykh kapel',** [Analysis of methods of the characteristic spectra of distribution of cloud drops], p. 36–46

Fedorova, A. A.: **O vliianii rel'efa na povtoriaemost' livnevykh ochagov po dannym radiolokatsionnykh stantsii,** [Effects of relief on recurrence of shower centers according to RDF station data], p. 47–56

Solov'ev, A. D.: **Metody iskusstvennogo obrazovaniia ledianykh chastits v pereokhlazhdennykh oblakakh,** [Methods for the artificial formation of ice particles in supercooled clouds], p. 57–70

Pacific Science Congress, 8th, Quezon City, Philippines, Nov. 16–28, 1953, Proceedings, Vol. IIA (Geology and Geophysics, Meteorology), pub. Quezon City, 1956

Meteorology, p. 915–1173

Resolutions adopted in the Eighth Pacific Science Congress concerning meteorology, p. 915–917

Spilhaus, Athelstan F.: **Report of the Standing Committee on Meteorology of the Pacific,** p. 918–926

Discussion on current research projects in the Pacific and research needs and techniques in Pacific meteorology, p. 927–929

Discussion on general meteorology of the Pacific region, p. 930–934

Cabrita, M. T. F.: **Analysis of some meteorological situations giving rise to fog in Macao,** p. 935–954

Pincock, G. L. and Turner, J. A.: **Advection fog along the British Columbia Coast and over the North Pacific Ocean during late summer and early autumn,** p. 955–962

Mordy, Wendell A.: **Seasonal variation in Hawaiian rainfall** [abstract only], p. 963

De la Cruz, Hugo and Hernandez, Pedro P.: **Seasonal weather patterns in the Philippines,** p. 964–968

Discussion on general problems of forecasting in the Pacific, p. 969–978

Schmidt, F. H.: **Meridional heat transport and subtropical jet stream,** p. 979–980

Symposium on general circulation in the Pacific, p. 981

Discussions on cloud physics with emphasis on warm rainfall, p. 982–984

Mordy, Wendell A.: **The Hawaiian cloud physics research project** [abstract only], p. 985

Kientzler, C. F.; Arons, A. B.; Blanchard, D. C. and Woodcock, A. H.: **Photographic investigation of the projection of droplets by bubbles bursting at a water surface** [abstract only], p. 985–986

Woodcock, A. H.: **Salt nuclei in marine air as a function of altitude and wind force** [abstract only], p. 986

Takahashi, Y., (comp.): **Record of cloud seeding in Japan, 1947–1954,** p. 987–1001

Discussions on Pacific typhoons and storm warning procedures, p. 1002–1005

Hatakeyama, H.: **Recent researches on typhoons in Japan,** p. 1006–1024

Gherzi, Ernest: **Definition of the vertical extent of tropical typhoons** [abstract only], p. 1025

Koh, Severino L. and Hernandez, Pedro P.: **Post-war tropical cyclones in the Philippines** [title only], p. 1025

Discussion on Pacific typhoons and storm warning procedures, p. 1026–1028

Discussion on easterly waves and inter-tropical convergence zone, p. 1029–1030

Estoque, Mariano A.: **Circulation and convergence over the tropical Northwestern Pacific from May to December,** p. 1031–1085

Discussion on microseismology as an aid to storm detection and tracking, p. 1087–1090

Inouye, W.; Hirono, T. and Murai, G.: **Microseisms and surf,** p. 1091–1098

Deppermann, C. E.: **Microseisms at Baguio,** p. 1099–1102

Discussion on climatology of the Pacific, p. 1103–1105

Berlage, H. P.: **Longperiodic oscillations in the atmospheric and hydrospheric circulation of the Pacific Ocean,** p. 1106–1112

Yamamoto, T.: **On the climatic change in Japan and its surroundings,** p. 1113–1128

Marshall, Colin: **Long term meteorological variation and their effects on land use in small South Pacific Islands,** p. 1129–1135

Arakawa, H.: **Percentage frequency of several weather elements in the NW-Pacific,** p. 1137–1144
Aki, Koichi and Miura, Takao: **Regional distribution of heavy rainfall in Japan,** p. 1145–1154
Moriarty, W. W.: **Types and sequences of summer pressure distributions over Australia,** p. 1155–1165
Discussion on climatology of the Pacific, p. 1167–1173

Puy de Dome. Observatoire, Bulletin, Ser. 2, No. 1, Jan./March 1957

Soulage, Guy: **Nuages équatoriaux naturels et essais de formation artificielle de cumulus précipitants,** [Natural equatorial clouds and an experiment in the artificial formation of cumulus precipitants], p. 9–24
Serpolay, R.: **Essais d'exploitation des techniques d'ensemencement des nuages surfondus en montagne, Vallée du Lys, Janvier-Février, 1957.** [Study of the use of techniques of seeding supercooled clouds in the mountain, Lys Valley, Jan./Feb. 1957], p. 1–8

Smithsonian Contributions to Astrophysics, Wash., D. C., Vol. 1, No. 1, 1956, Whipple, Fred L. (ed.), **New horizons in astronomy**

Evans, J. W. and Dunn, R. B.: **Solar instrumentation,** p. 5–8
Keller, Geoffrey: **Astronomical seeing and scintillation,** p. 9–11
Tousey, R.: **Rocketry,** p. 39–44
Herget, Paul: **Computing machines in astronomy,** p. 45–46
Chandrasekhar, S.: **Turbulence,** p. 47
Rinehart, John S.: **Meteorites,** p. 81–82
Whipple, Fred L.: **Meteors,** p. 83–86
Meinel, A. B.: **Airglow and aurora,** p. 95–97
Roberts, Walter Orr: **Solar-terrestrial relationships: weather and communications,** p. 99–101

Tellus, Stockholm, Vol. 9, No. 3, Aug. 1957

Bolin, B.: **Carl-Gustaf Rossby: In memoriam,** p. 257–258
Defant, F. and Taba, H.: **Threefold structure of the atmosphere and the characteristics of the tropopause,** p. 259–274
Thompson, Philip Duncan: **Uncertainty of initial state as a factor in the predictability of large scale atmospheric flow patterns,** p. 275–295
Sigtryggsson, Hlynur and Wiin-Nielsen, Aksel: **Experiments in numerical forecasting, using space-smoothed fields,** p. 296–312
Petterssen, Sverre: **A note on verification of prognostic charts,** p. 313–315
Johnson, D. H.: **Preliminary research in objective analysis,** p. 316–322
Berggren, Roy: **On the accuracy of 500 mb analysis with special reference to numerical forecasting,** p. 323–340
Ludlam, F. H.: **Noctilucent clouds,** p. 341–364
Witt, Georg: **Noctilucent cloud observations,** p. 365–371
Rooth, C.: **On a special aspect of the condensation process and its importance in the treatment of cloud particle growth,** p. 372–377
Schmidt, F. H.: **On the diffusion of heated jets,** p. 378–383
Twomey, S.: **Electric charge separation in subfreezing cumuli,** p. 384–393
Bigg, E. K.: **New technique for counting ice-forming nuclei in aerosols,** p. 394–400
Stommel, Henry and Veronis, George: **Steady convective motion in a horizontal layer of fluid heated uniformly from above and cooled non-uniformly from below,** p. 401–407
Kinsman, Blair: **Proper and improper use of statistics in geophysics,** p. 408–418
Welander, Pierre: **Note on the self-sustained oscillations of a simple thermal system,** p. 419–420
Callendar, G. S.: **Effect of fuel combustion on the amount of carbon dioxide in the atmosphere,** p. 421–422
Current data on the chemical composition of air and precipitation, p. 423–427
Current data on CO_2 in Ccandinavia, p. 427

Vsesoiuznoe Geograficheskoe Obshchestvo, Leningrad, Izvestiia, Vol. 89, No. 1, Jan./Feb. 1957

Khromov, S. P.: **Geograficheskoe rasprostranenie mussonov,** [Geographical distribution of monsoons], p. 7–13
Maksimovich, G. A.: **Duiushchie kolodtsy, voronki i treshchiny,** [Wind holes, wells and fissures], p. 68–69

Vol. 89, No. 2, March/April 1957

Shvede, E. E.: **Iulii Mizhailovich shokal'skiĭ i Geograficheskoe obshchestvo SSSR k 100 letniu so dnia rozhdeniia,** [I. M. Shokal'skii and the Geographical Society of the U.S.S.R.], p. 93–100

Vol. 89, No. 3, May/June 1957

Khromov, S. P.: **K voprosu o kontinental'nosti klimata,** [The continentality of climate], p. 221–225
Selianinov, G. T.: **Klassifikatsiia klimatov na proizvodstvennoĭ osnove,** [Climatic classification from the economic point of view], p. 225–229
Mamaev, O. I.: **N. N. Miklukho-Maklaĭ kak okeanograf,** [N. N. Miklukho-Maklaĭ, oceanographer], p. 255–259
Znamenskiĭ, A. I.: **[Review of] I. A. Volkov: O povedenii vetrovogo potoka za barkhanom,** [Wind flow characteristics on the lee-side of a barkhan], p. 259–261 (*See* 8.3–212, March 1957, *MAB*)

Weather, London, Vol. 12, No. 10, Oct. 1957

Green, S. W.: **The place of meteorology in liberal education,** p. 301–310
Karapiperis, Leon N.: **Halcyon days,** p. 311–313
Reynolds, G.: **Variations in visibility over urban and rural areas,** p. 314–320
Coutts, H. H.: **Unusual orographic cloud formation,** p. 320–322
Sen Gupta, Prabhat K.: **Sunspot cycle in regional rainfall,** p. 322–324
Read, R. S.: **Weather of September, cool, cloudy, very wet in the west,** p. 325
Murray, M.: **Snowfall in Leicestershire, Feb. 18–19, 1956,** p. 329–330

Vol. 12, No. 11, Nov. 1957

Sawyer, J. S.: **Jet stream features of the earth's atmosphere,** p. 333
The new Meteorological Committee, p. 344
Fritz, Sigmund: **The polar whiteout,** p. 345
Meaning of words and phrases used in weather forecasts to describe temperature and frost, p. 349
Mason, B. J.: **[Obituary note on] Prof. Carl-Gustaf Rossby,** p. 351
Vesecky, A.: **Meteorology in Czechoslovakia,** p. 352
Griffin, R.: **Malham Tarn, Aug. 1957,** p. 354
Scorer, R. S.: **Archibald wonders, or was Sir Napier sure?,** p. 356

Weather Radar Conference, 6th, Cambridge, Mass., March 26–28, 1957, Proceedings, pub. 1957

Jones, Douglas M. A.: **Shapes of raindrops,** p. 1–7
Schotland, R. M.: **The distortion of raindrops by an electrical field,** p. 9–14
Magono, Choji: **On the behaviour of water droplets in the air at temperatures below freezing,** p. 15–19
Atlas, David and Chmela, Albert C.: **Physical-synoptic variations of raindrop size parameters,** p. 21–29
Magono, Choji: **On snowflakes,** p. 31–36
Gunn, K. L. S. and Marshall, J. S.: **The distribution with size of aggregate snowflakes,** p. 37–41
Newell, Reginald E. and Patterson, Leif: **Comparison of measured and calculated values of depolarization for dry snowflakes,** p. 43–49
Battan, Louis J.: **Influence of the environment on the initiation of precipitation in tropical cumuli over the ocean,** p. 51–59
Brook, Marx: **Relationship between the initial radar echo and the initial electric field in isolated Thunderstorm cells,** p. 61–68
Wexler, Raymond and Atlas, David: **Moisture supply and growth of stratiform precipitation,** p. 69–76
Harper, W. G.: **Variation with height of rainfall below the melting level,** p. 77–82
Wexler, Raymond: **The lapse rate in the melting layer,** p. 83–87
Langleben, M. P.: **Snow pattern revealed by constant-altitude maps,** p. 89–98
Rogers, Roddy R.: **Radar measurement of gustiness,** p. 99–106
Hitschfeld, Walter: **Three-dimensional radar patterns related to surface hail reports,** p. 107–116
Donaldson, Ralph J., Jr.: **Analysis of severe convective storms observed by radar,** p. 117–126

Cook, Billie J.: **Determination of hail by weather bureau search radar,** p. 127–133
Bigler, Stuart G.: **The use of composite radar photographs to identify severe storm-generating regions in squall lines,** p. 135–142
Hoecker, Walter H., Jr.: **Abilene, Texas, area tornadoes and associated radar echoes of May 27, 1956,** p. 143–150
Leach, Wayne: **Observed characteristics of convective cell bands,** p. 151–156
Watson, Bruce F. and Bauer, Siegfried J.: **Sferics patterns and associated meteorological conditions,** p. 157–163
Senn, H. V. and Hiser, H. W.: **Tracking hurricanes with radar,** p. 165–170
Smith, Robert L.: **Synoptic scale radar storm observations,** p. 171–177
Boucher, Roland J.: **Synoptic-dynamic implications of 1.25 CM vertical beam radar echoes,** p. 179–188
Copeland, Robert C. and Hexter, Paul L., Jr.: **The association of surface wind convergence with precipitation patterns,** p. 189–199
Watanabe, Kazuo: **The effect of cold air advection upon radar echo,** p. 201–205
Blackmer, Roy H., Jr.: **The use of radar data in mesometeorological analysis,** p. 207–213
Schuetz, John: **The relationship between maximum echo top and stability,** p. 215–220
Austin, Pauline M.: **Distribution of precipitation echoes as observed by radar at Cambridge, Massachusetts,** p. 221–226
Riggs, Lowell P. and Truppi, Lawrence E.: **A survey of radar climatology,** p. 227–232
Mueller, E. A.: **Attentuation calculations from drop size distributions,** p. 233–236
Semonin, Richard G.: **Radar-indicated rainfall estimates corrected for precipitation attenuation,** p. 237–242
Gerhardt, J. R. and Tolbert, C. W.: **Rain attenuation and backscattering measurements at 4.3 millimeter wavelength,** p. 243–252
Hiser, Homer W.: **Comparisons between a 10-CM and a 5-CM wavelength radar for meteorological purposes,** p. 253–259
Leasure, Richard B.; Durham, K. S.; Tobias, J. J. and Dudrow, R. A.: **Radar detection of angel activity with corresponding refractometer soundings,** p. 261–266
Harper, W. G.; Ludlam, F. H. and Saunders, P. M.: **Radar echoes from cumulus clouds,** p. 267–272
Plank, Vernon G.; Cunningham, Robert M. and Campen, Charles F., Jr.: **The refractive index structure of a cumulus boundary and implications concerning radio wave reflection,** p. 273–280
Elder, Floyd C.: **Some persistent "ring" angels on high-powered radar,** p. 281–290
Lidga, Myron G. H.: **The use of radar for lightning observation,** p. 291–296
Brantley, James O., Jr. and Barczys, Daniel A.: **Some weather observations with a continuous-wave doppler radar,** p. 297–306
Kodaira, Nobuhiko: **An iso-echo contouring device,** p. 307–314
Kessler, Edwin, III: **Reflectivities from unmodified radar displays,** p. 315–320
Marshall, J. S.: **The constant-altitude presentation of radar weather patterns,** p. 321–324
East, T. W. R. and Dore, B. V.: **An electronic constant-altitude display,** p. 325–330
Marshall, J. S. and East, T. W. R.: **Possible roles of memory tubes in presentation and transmission of radar weather data,** p. 331–332
Battan, Louis J.: **Use of chaff for wind measurements,** p. 333–337
Ruskin, R. E.: **A method of obtaining constant altitude and other PPI pictures from simple weather radars,** p. 339–340
Imai, Ichiro: **Weather radar network in Japan,** p. 341–345
Imai, Ichiro: **Researches in radar meteorology at the Meteorological Research Institute,** p. 347–356
Magono, Choji: **Recent investigations in cloud physics in Japan,** p. 357–358
Jones, R. F.: **Weather-radar research in the meteorological office,** p. 359–362
Basu, S.: **A brief note on the weather radar studies undertaken in the India meteorological departments,** p. 363–364
Bell, G.: **Weather radar activities of the German meteorological service,** p. 365
Foster, Hal: **Critical problems in RADU,** p. 367
Jay, Lee A.: **Weather radar instrumentation at the Army Electronic Proving Ground,** p. 369–372

Proceedings Supplement, pub. 1957

Ludlam, Frank H.: **Phases in the evolution of cumulonimbus,** p. 1–7
Tarble, R. D. and Conover, L. F.: **Use of radar in the field of hydrology,** p. 9–16
Richardson, Robert E.; Stacey, Joseph M. and Kohler, Herbert M.: **Radar angels at South Truro, Mass.,** p. 17–22

Lhermitte, Roger M.: **Display of precipitation echo contours**, p. 23–27
Summary of Discussion for Session on Particle Structure and Size Distribution, reviewed by **K. L. S. Gunn and R. J. Donaldson**, p. 29–31
Summary of Discussion for Session on Precipitation Physics, reviewed by **J. S. Marshall and K. L. S. Gunn**, p. 33–37
Summary of Discussion for Session on Severe Storms, reviewed by **G. Stout and R. Blackmer**, p. 39–45
Summary of Discussion for Session on Scattering and Attenuation, reviewed by **T. W. R. East and Roddy R. Rogers**, p. 47–49
Summary of Discussion for Session on Anomalous Echoes, reviewed by **T. W. R. East and Roddy R. Rogers**, p. 51–53
Summary of Discussion for Session on Techniques and Instrumentation, reviewed by **Wilbur H. Paulsen and Pio J. Petrocchi**, p. 55–57

World Meteorological Organization, WMO Bulletin, Vol. 6, No. 4, Oct. 1957

Davies, D. A.: **International co-ordination of meteorological activities: Secretary-General's address to the 24th session of the U. S. Economic and Social Council**, p. 126–130
Ashford, O. M.: **International Geophysical Year**, p. 131–134
Ashford, O. M.: **Meteorology: a three dimensional science**, p. 134–138
Mörikofer, W.: **The Hamburg comparisons of long-wave radiometers**, p. 139–143
Collaboration with other international organizations, p. 143–145
Langlo, K.: **Second session of the Commission for Instruments and Methods of Observation**, p. 146–149
Activities of the Technical Commission, p. 149–150
Technical assistance programme, p. 151–156
Nyberg, A.: **[Obituary of] Professor C. G. Rossby**, p. 157–158
[Obituary note on] Professor H. U. Sverdrup, p. 158
[Obituary note on] H. I. Anda, p. 158–159
Activities of regional associations, p. 159–
Members of the World Meteorological Organization, p. 166

PART IV. AUTHOR AND SUBJECT INDEXES

In this section will be found reference to the number given at the head of each abstract or entry. In Part I each entry begins with the number 8.10 and in Part II in the Bibliography on Propagation of Radio Waves through the Troposphere each entry begins with the number and letter 8J. This index is divided into three parts:

Index of Authors — Index of Subjects — Index of Geographic Locations

INDEX OF AUTHORS

Abbott, R., 8J–153
Aden, A. L., 8J–2
Agy, V., 8.10–132
Albertson, M. L., 8.10–207
Alfvén, H., 8.10–163
Al'pert, IA. L., 8J–3
Altshuller, A. P., 8.10–121
American Geophysical Union, 8.10–248
American Meteorological Society, 8.10–35, 8.10–66, 8.10–118, 8.10–149
Ames, L. A., 8J–63
Ammerman, C. R., 8J–58
Ananthakrishnan, R., 8.10–231
Anastassiades, M., 8J–187
Anderson, H. W., 8.10–63
Anderson, L. J., 8J–4, 8J–5, 8J–129, 8J–187
Anderson, M. S., 8.10–4
Andrillat, Mme, Y., 8.10–155
Aono, Y., 8J–64
Apollonov, A. P., 8.10–2
Arctic, Montreal, 8.10–1
Arctic Inst. of North America, 8.10–1
Armstrong, T., 8.10–1
Arsac, J., 8J–187
Artamonov, A. A., 8.10–115
Arvola, W. A., 8J–7, 8J–152
Asar, H. J., 8.10–236
Ashford, O. M., 8.10–50
Asplund, S. E., 8.10–116
Atlas, D., 8.10–242
Aujeszky, L., 8.10–50
Austin, P. M., 8.10–88
Austria. Zentralanstalt für Meteorologie und Geodynamik, 8.10–96

Bagariatskiĭ, B. A., 8.10–299
Baird, P. D., 8.10–1
Baker, E. T., 8.10–56
Bakthavathsalu, C. M., 8.10–93
Balasubramanian, C., 8.10–93
Ball, F. K., 8.10–31
Barbados Weather Observers' Association, 8.10–148
Barghausen, A. F., 8J–65
Barlow, E. W., 8.10–285
Barsis, A. P., 8J–41, 8J–66, 8J–101, 8J–121, 8J–184
Barth, C. A., 8.10–156
Basu, S. C., 8.10–220
Bates, D. R., 8.10–300
Battaglia, A., 8J–187
Baum, W. A., 8.10–116
Baxter, W. J., 8.10–9
Beals, C. S., 8.10–1
Bean, B. R., 8J–6, 8J–42, 8J–43, 8J–66, 8J–67, 8J–153 to 8J–156, 8J–178, 8J–182, 8J–185, 8J–187
Beaumont, R. T., 8.10–113
Beckmann, B., 8J–187
Beckmann, P., 8J–187
Bell, C., 8.10–10
Bell, T. H., 8.10–10
Bellaire, F. R., 8J–7
Belostotsky, E. M., 8.10–2
Berg, H., 8.10–274
Beriushev, K. G., 8.10–270
Berlage, H. P., 8.10–145
Bernhardt, F., 8.10–173
Beyers, N. J., 8J–186
Bigler, S. G., 8.10–228
Bilancini, R., 8.10–50
Bilham, E. G., 8.10–47
Bindon, H. H., 8.10–97
Bird, L. G., 8.10–221
Birnhaum, G., 8J–68
Blackadar, A. K., 8.10–186
Blackmer, R. H., Jr., 8.10–88
Blaney, H. F., 8.10–208
Blevis, B. C., 8.10–89
Bochenek, K., 8J–187
Bögel, Arnold, 8.10–152
Bollmann, H., 8.10–14
Bond, T. E., 8.10–154
Booker, H. G., 8J–69, 8J–157
Boucher, R. J., 8.10–117
Boudouris, G., 8J–187
Bourgeois, J., 8.10–164
Bourret, R. C., 8.10–21
Boyer, M. C., 8.10–237
Bremmer, H., 8J–8, 8J–44, 8J–187
Britt, C. O., 8J–61
Brocks, K., 8J–122
Brooks, C. E. P., 8.10–7
Brooks, C. F., 8.10–44
Brown, G. M., 8.10–1
Browne, I. C., 8J–9
Bruce, C. E. R., 8.10–293
Bruce, F. M., 8.10–294
Brunt, A. T., 8.10–238
Buchinskiĭ, I. E., 8.10–36
Buell, C. E., 8.10–189
Bullington, K., 8J–10, 8J–70, 8J–71
Bultot, F., 8.10–15
Burstall, T., 8.10–32
Bussey, H. E., 8J–68
Byers, H. R., 8.10–289

Cahoon, B. A., 8J–154, 8J–155
California. Univ. at L. A. Institute of Geophysics, 8.10–156
Campen, C. F., 8J–72, 8J–125
Capps, F. M., 8J–54, 8J–134
Carapiperis, L., 8J–187
Carroll, T. J., 8J–45, 8J–46, 8J–73, 8J–123, 8J–158, 8J–187
Carter, D., 8J–74
Caton, P. G. F., 8.10–232
Chalmers, J. A., 8.10–295
Changnon, S. A., 8.10–228
Chapman, H., 8J–127
Chisholm, J. H., 8J–75, 8J–187
Clarke, R. F., 8J–124
Clavier, P., 8J–187
Colbert, L. O., 8.10–1

Cole, A. E., 8J–72
Collier, J. S., 8J–76
Colloque International sur les Problèmes d'Actualité dans la Propagation des ondes Radioélectriques, Paris, 1956, 8J–187
Conference on Radio Meteorology, Univ. of Texas, Austin, Nov. 9–12, 1953, 8J–11
Contract AF 18(600)-133, 8J–14
Contract AF 19(122)-453, 8.10–156
Contract AF 19(604)-494, 8J–14, 8J–165
Contract AF 19(604)-1141, 8.10–27
Contract AF 19(604)-1495, 8.10–22
Contract Cwb-9066, 8.10–21
Contract DA 3-99-03-022, 8J–62
Contract DA-36-030-SC-5663, 8J–56
Contract DA 36-039 SC-64723, 8.10–87, 8.10–90
Contract DA 36-039 SC-71136, 8.10–88
Contract Nonr 375(01), 8J–59, 8J–61
Contract Nonr-1600(00), 8.10–286
Contract NR 071 032, 8J–61
Contract SC, MIPR R-54-69-Sc-91, 8J–62
Cook Research Laboratory, 8.10–66
Cook, S. F., 8.10–37
Cousins, P. S., 8.10–285
Cowan, L. W., 8J–12, 8J–13
Craddock, J. M., 8.10–165
Crain, C. M., 8J–14, 8J–15, 8J–47, 8J–77, 8J–127, 8J–187
Cressey, G. B., 8.10–5
Cunningham, R., 8J–125
Cushina, S. W., 8.10–7
Cushing, S. W., 8.10–7

Darbyshire, J., 8.10–45, 8.10–71
Das, A. K., 8.10–282
Das, P. M., 8J–188
Davies, D. E., 8.10–181
Davies, F. T., 8.10–1
Day, Sir A., 8.10–33
De, A. C., 8J–188
Deam, A. P., 8J–78
Dean, G. A., 8.10–194
Decker, M. T., 8J–65
de Bettencourt, J. T., 8J–69, 8J–75
De Fiore, O., 8.10–263
Desai, B. N., 8.10–147
Di Benedetto, Felice, 8.10–129
Diamond, R. J., 8.10–22
Dickson, F. H., 8J–16
Döös, B. R., 8.10–72
Doherty, L. H., 8J–17, 8J–20
Dollfus, A., 8.10–119
Dolukhanov, M., 8J–53
Donn, W. L., 8.10–146
Dougherty, H. T., 8J–93
Doundoulakis, G., 8J–133
Doyle, H. N., 8.10–83
Drimmel, J., 8.10–218
Du Castel, F., 8J–187
Dukhanina, Z., 8.10–83
Durkee, A. L., 8J–70
Durst, C. S., 8.10–57

Eaton, M. A., 8.10–72
Effenberger, E., 8.10–122
Efimov, I. T., 8.10–168
Egli, J. J., 8J–16
Egor'eva, A. V., 8.10–49
Egorov, V. V., 8.10–170
Ehricke, D. A., 8.10–51
Eldridge, R. H., 8.10–151
Ellis, G. R., 8.10–302
Elschner, H., 8.10–82
Elser, H. L., 8.10–114
Engel, L., 8.10–128
Epstein, J., 8J–18

Fannin, B. M., 8J–78
Farthing, E. D., 8.10–185
Faucher, G. A., 8.10–289
Fea, G., 8.10–195
Fedorov, E. E., 8.10–48
Fedorova, N. I., 8.10–299
Feigel'son, E. M., 8.10–153
Feinberg, E. L., 8J–3
Feinstein, J., 8J–48, 8J–49
Fel'dman, Ia. I., 8.10–48
Fidler, J. C., 8.10–67
Fine, H., 8J–50, 8J–176
Finland. Ilmatieteellinen Keskuslaitos, 8.10–95
Fletcher, R. D., 8.10–40, 8.10–42
Flohn, H., 8.10–41, 8.10–46, 8.10–271
Florida. State Univ. Tallahassee, Dept. of Met., 8.10–286
Florman, E. F., 8J–79
Fock, V. A., 8J–187
Fomin, L. M., 8.10–74
Ford, E. F., 8.10–191
Friedman, B., 8J–142
Friedrich, W., 8.10–64
Fuerst, R. E., 8.10–11
Fukushima, M., 8J–94
Furutsu, K., 8J–80, 8J–126

Gabriel, K. R., 8.10–235
Gangopadhyaya, M., 8J–188
Gates, D. M., 8.10–99
Gaulin, R. P., 8.10–278
Gazzola, A., 8.10–171, 8.10–195
Gerhardt, J. R., 8J–47, 8J–59, 8J–127, 8J–165
Gerks, I. H., 8J–128
Germany. Deutscher Wetterdienst in der US-Zone, 8.10–264
Germany. Reichsamt für Wetterdienst. Bibliothek, 8.10–264
Gibbs, W. J., 8J–51
Gilkey, H. T., 8.10–68
Ginzburg, V. L., 8J–3
Girs, A. A., 8.10–107
Godson, W. L., 8.10–27
Goedecke, E., 8.10–108
Gold, E., 8.10–47
Goldman, D. T., 8.10–54
Gol'tsberg, I. A., 8.10–60
Gordon, W. E., 8J–82, 8J–157
Goss, R. N., 8J–142
Gossard, E. E., 8J–4, 8J–5, 8J–129, 8J–160
Goubau, G., 8J–187
Gough, M. W., 8J–83
Gozzini, A., 8J–187
Grant, A. S. G., 8J–52
Gt. Brit. Meteorological Office, 8.10–249
Greenburg, L., 8.10–123, 8.10–124
Grigor'ev, A. A., 8.10–256
Grønlund, M., 8J–030
Grosse, B., 8.10–192
Groth, K., 8.10–209
Gudmandsen, P., 8J–84, 8J–161

Hakkarinen, W., 8J–25
Halbich, F., 8.10–277
Harang, L., 8.10–16
Hare, F. K., 8.10–27, 8.10–65
Harman, J. C., 8J–54
Harper, W. G., 8.10–244
Harris, D. L., 8.10–75
Hartz, T. R., 8.10–297
Hasegawa, T., 8J–147
Hasse, L., 8J–122
Hay D. R., 8J–85
Hazzaa, I. B., 8.10–132
Hearn, A. G., 8.10–161
Heastie, H., 8.10–28
Henry, R. M., 8.10–116
Henry, T. J. G., 8.10–196
Hepburn, F., 8.10–92
Herbst, W., 8.10–84
Herbstreit, J. W., 8J–16, 8J–19, 8J–86 8J–177,
Herrmann, E., 8.10–6
Hess, S. L., 8.10–286
Heywood, H., 8.10–69
Higashi, A., 8.10–103

Hills, E. S., 8.10–273
Hinds, M. K., 8.10–203
Hinteregger, H. E., 8.10–162
Hinzpeter, H., 8.10–229
Hiser, H. W., 8.10–21
Hirao, K., 8J–87
Hodgson, J. H., 8.10–1
Holland, J. D., 8.10–180
Hood, A. D., 8J–20
Hooper, A. H., 8J–131
Hope, E. R. (*trans.*), 8.10–299
Hopkins, R. U. F., 8J–132
Horn, J. D., 8J–156
Hornberg, K. O., 8J–62, 8J–66
Hounam, C. E., 8.10–239
Housley, J. G., 8.10–76
Huff, F. A., 8.10–87
Hughes, B. P., 8.10–149
Hughes, R. G., 8.10–56
Huntington, E., 8.10–7

Iakovlev, O. I., 8J–179
Ikeda, M., 8J–94
Illinois. State Water Survey Div., 8.10–87, 8.10–90
Inkster, W. J., 8J–70
Innes, M. J. S., 8.10–1
Institute of Radio Engineers, 8J–21, 8J–88
International Scientific Radio Union. Comité National Français de Radioélectricité Scientifique, 8J–187
Iselin, C. O'D., 8.10–1
Ishiguro, S., 8.10–45
Itagaki, K., 8.10–103
Ittner, N. R., 8.10–154

Jacobs, M. B., 8.10–123, 8.10–124
Janes, H. B., 8J–89, 8J–90, 8J–101 8J–182
Japan. Radio Research Laboratories, Tokyo, 8J–91
Jehn, K. H., 8J–22
Joesting, H. R., 8.10–1
Johler, J. R., 8J–162
Johnson, C. M., 8J–175
Johnson, H. A., 8.10–1
Johnson, W. E., 8J–23
Johnston, H. S., 8.10–125
Jones, I. L., 8.10–197
Jones, R. F., 8J–92
Jones, R. N., 8J–54

Kalle, K., 8.10–233
Kamen, I., 8J–133
Kanaya, S., 8J–97
Kaplan, H. G., 8.10–213
Kaplan, J., 8.10–156
Kazanskiĭ, A. B., 8.10–184
Kazanský, B., 8J–53
Keitz, E. L., 8.10–105
Kelly, C. F., 8.10–154
Kent, R. D., 8.10–287
Kérdö, I., 8.10–81
Kerner, G., 8.10–19
King, K. M., 8.10–100
Kirby, R. S., 8J–54, 8J–93, 8J–134
Kirkman, J. R., 8.10–295
Kiss, I., 8.10–279
Klinker, L., 8J–55, 8J–135, 8J–163
Kolkki, O., 8.10–95
Kono, T., 8J–94
Konzo, S., 8.10–68
Kopcewicz, T., 8.10–111
Koschmieder, H., 8.10–222 to 8.10–224
Krasikov, P. N., 8.10–61
Krick, I. P., 8.10–280
Kruhl, H., 8.10–135
Kulikovsky, G. G., 8.10–2
Kurihara, Y., 8J–95

Lacy, R. E., 8J–136
Landmark, B., 8.10–197, 8.10–303
Large, M. I., 8.10–292, 8.10–296
Lauter, E. A., 8J–55
Laver, F. J. M., 8J–96
Law, P. G., 8.10–32
Lee, R., 8.10–144, 8.10–182
Legget, R. F., 8.10–1
Lhermitte, R., 8.10–91
Long, W. H., 8.10–116
Lorenz, E. N., 8.10–141
Loup, J., 8.10–210
Lowell, P. D., 8J–24
Lowry, W. P., 8.10–234
Lund, C. O., 8J–130
Lungersgauzen, G. F., 8.10–266

McCaffery, W. D. S., 8.10–268
Macfarland, J., 8.10–7
MacFarlane, M. A., 8.10–27
McGavin, R. E., 8J–121
McGill Univ. Arctic Meteorology Research Group, 8.10–27
McLaughlin, D. B., 8.10–120
McQuate, P. L., 8J–93
Madill, R. G., 8.10–1
Maeda, H., 8.10–290
Maenhout, A., 8J–137
Makarova, T. T., 8.10–252
Malkus, J. S., 8.10–225
Maloney, L. J., 8J–65
Mansfield, W. V., 8J–103
Marconi, G., 8J–123
Marine Observer, 8J–1, 8J–159
Maruyama, H., 8J–87
Mason, D. C., 8.10–240
Massachusetts Inst. of Technology, Dept. of Meteorology, 8.10–88
Matsushita, S., 8.10–298
Meade, P. J., 8.10–126
Meany, F. M., 8J–42, 8J–67
Megaw, E. C. S., 8J–25, 8J–164
Mertsalov, A. N., 8.10–177
Meteorological Magazine, London, 8.10–268
Meteorology Research, Inc., Pasadena, 8.10–22
Mevel, J., 8J–187
Mexico. Interstate Stream Commission, 8.10–261
Meyer, H., 8.10–222
Miami, Univ. (of Coral Gables, Fla.). Marine Lab., 8.10–21
Mick, A. H., 8.10–1
Miller, J. F., 8.10–250
Misme, P., 8J–187
Miya, Ken-ichi, 8J–97
Monin, A. S., 8.10–138, 8.10–184
Montalto, M., 8.10–195
Monteith, J. L., 8.10–219
Montgomery, N. S., 8.10–133
Morais, J. C. de, 8.10–265
Morgenstern, P., 8.10–88
Morris, T. R., 8.10–226
Morrow, W. E., 8J–187
Moscow. Institut Aviatsionnoi Meditsiny i. I. P. Pavlova, 8.10–2
Moulton, K. B., 8.10–211
Mount Washington Observatory, 8.10–117
Moyer, V. E., 8J–138, 8J–165
Muchmore, R. B., 8J–98
Mueller, E. A., 8.10–90
Muramatsu, K., 8J–64
Murcray, W. B., 8.10–159

Naito, K., 8J–26, 8J–27
Nania, A., 8.10–106
Natarajan, K. K., 8.10–167
Nature, London, 8.10–39, 8J–166
Neill, J. C., 8.10–87
Neumann, H. G., 8.10–223
Neumann, J., 8.10–235
New Mexico. Interstate Stream Commission, 8.10–260, 8.10–261
New Mexico. State Engineer Office, 8.10–260, 8.10–261
Newman, P., 8J–63
Nio, L. D., 8.10–243
Nishikori, K., 8J–94
Northover, F. H., 8J–99
Norton, K. A., 8J–19, 8J–28, 8J–100 to 8J–103, 8J–180
Nurimen, A., 8.10–17
Nyberg, A., 8.10–139

Obuljen, A., 8.10–140
Ohmstede, W. D., 8.10–174

Oliver, V. J., 8.10–241
Omholt, A., 8.10–157, 8.10–301
Orlova, V. V., 8.10–206

Pace, N., 8.10–37
Palmén, E., 8.10–142
Palmer, C. E., 8.10–174
Palson, W. C., 8.10–25
Partch, V., 8.10–9
Pasquill, F., 8.10–126
Pastukhov, V. A., 8.10–153
Paszyński, J., 8.10–258
Patton, C. P., 8.10–18
Paulhus, J. L. H., 8.10–250
Pavlova, I. P., 8.10–2
Pedersen, K., 8.10–16
Peixoto, J. P., 8.10–199
Penchev, P., 8.10–251
Penndorf, R., 8.10–283
Pereira, A. B., 8.10–265
Peterson, D. W., 8J–18, 8J–56
Philipps, H., 8.10–12
Phillips, E. L., 8.10–166
Phillpot, H. R., 8J–189
Pierce, E. T., 8.10–296
Pineo, V. C., 8J–139, 8J–140
Pisharoty, P. R., 8.10–147
Plank, V. G., 8J–125, 8J–141
Pobetova, T. A., 8.10–62
Poeverlein, H., 8J–104
Pohl, W., 8.10–160
Portmann, P. A., 8J–75
Potter, J. G., 8.10–281
Potts, D. H., 8J–142
Powell, P. G., 8.10–58
Price, A. G., 8.10–7
Proctor, J. D., 8.10–59
Prohaska, F., 8.10–178
Project DA 3-99-07-022, 8.10–90
Puckle, G. M., 8.10–98

Raab, L., 8.10–139
Radio Corporation of America, 8J–56
Rae, R. W., 8.10–1
Randall, D. L., 8J–24, 8J–57
Rao, B. R., 8.10–198
Rao, M. S., 8.10–198
Rao, V. N., 8.10–77
Rathjens, C., Sr., 8.10–19
Rathjens, C., Jr., 8.10–19
Rawson, D. W., 8.10–1
Reed, R. J., 8.10–183
Regener, V. H., 8.10–130
Reichelderfer, F. W., 8.10–149
Reid, G. C., 8.10–297
Rempel, R. W., 8J–142
Revelle, R., 8.10–78
Rice, P. L., 8J–19, 8J–101, 8J–102, 8J–177
Rice, S. O., 8J–29
Riddle, R. L., 8J–58
Ring, R. M., 8J–73, 8J–158
Robbins, R. L., 8J–30
Roche, J. F., 8J–75
Rodewald, M., 8.10–73, 8.10–175, 8.10–176
Rogers, T. F., 8J–63, 8J–105
Rohan, P. K., 8.10–55
Rose, H. E., 8.10–3
Rosenthal, S. L., 8.10–116
Rose, H. E., 8.10–3
Rosenam, N., 8.10–212
Rossi, V., 8.10–95
Rowden, R. A., 8J–167
Rowley, D., 8.10–1
Ryle, M., 8.10–38

Sänger, R., 8.10–214
Sagalyn, R. C., 8.10–289
Samlenski, E., 8.10–19
Saltzman, B., 8.10–199
Sauberer, F., 8.10–269
Saunders, P. M., 8.10–137
Sawyer, J. S., 8.10–203
Schachenmeier, R., 8J–31, 8J–143
Schaefer, V. J., 8.10–86
Schafer, G. E., 8J–19
Schlesinger, S. P., 8J–175
Schmidt, F. H., 8.10–20
Schreider, E., 8.10–275
Schüepp, W., 8.10–94
Schulz, H., 8.10–224
Schwerdtfeger, W., 8.10–178
Science, Wash., D. C., 8.10–52
Scott, J. R., 8.10–201, 8.10–202
Scott, R. F., 8.10–169
Sedra, R. N., 8.10–132
Seilkopf, H., 8.10–79
Sekera, Z., 8.10–284
Senn, H. V., 8.10–21
Setty, C. S. G. K., 8.10–197
Shabel'nikov, A. V., 8J–181
Shapaev, V. M., 8.10–257
Sharp, C. E., 8J–136
Sharp, F. A., 8.10–201
Sharp, R. P., 8.10–1
Shaw, E. B., 8.10–7
Shaw, R. F., 8.10–241
Shokal'skiĭ, IU. M., 8.10–49
Short, P. J., 8J–103, 8J–177
Shu, E. K., 8.10–288
Siebert, M., 8.10–179
Siksna, R., 8.10–215
Silleni, S., 8J–106
Silverman, R. A., 8J–107, 8J–144, 8J–168
Simon, J. C., 8J–187
Sindowski, K-H., 8.10–193
Singer, S. F., 8.10–54
Sinha, K. L., 8.10–187
Sivadjian, J., 8.10–101
Smirnov, N. S., 8.10–61
Smith, E. K., Jr., 8J–32
Smith, T. B., 8.10–22
Smyth, J. B., 8J–132, 8J–187
Snow, G., 8.10–285
Société des Radioélectriciens, 8J–187
Sommermeyer, K., 8.10–84
Spock, M., Jr., 8.10–87
Squires, P., 8.10–230
Stack-Forsyth, E. F., 8J–108
Staley, R. C., 8J–22
Stamp, L. D., 8.10–8
Staras, H., 8J–109, 8J–145
Stark, J. W., 8J–167
Starkey, B. J., 8J–146
Steinhauser, F., 8.10–291
Steinman, I. (*trans.*), 8.10–2
Stelzer, F., 8.10–267
Stewart, D. T., 8.10–158
Stoecker, W. F., 8.10–68
Straiton, A. W., 8J–15, 8J–59, 8J–61
Strand, K. G., 8H–33
Strauch, K. T., 8.10–70
Streltzov, W. W., 8.10–2
Sturgis, S. D., Jr., 8.10–254
Suess, H. E., 8.10–78
Suomi, V. E., 8.10–100
Suratman, P. C., 8.10–243
Sutcliffe, R. C., 8.10–43
Suzuki, M., 8J–147
Svien, A. J., 8J–128
Swartz, J. R., 8.10–272
Swingle, D. M., 8J–34, 8J–35
Swoboda, G., 8.10–50

Tanner, C. B., 8.10–100
Tao, K., 8J–60, 8J–110, 8J–148
Taylor, A. P., 8J–131
Taylor, D. C., 8.10–76
Taylor, W. M., 8.10–86
Texas Univ. Electrical Engineering Research Lab., 8J–14, 8J–59, 8J–61, 8J–111, 8J–165, 8J–169
Thams, J. Chr., 8.10–102
Thiruvenkatachar, V. R., 8.10–53
Thom, H. C. S., 8.10–245, 8.10–247
Thomas, M. D., 8.10–127
Thompson, M. C., 8J–86, 8J–190
Thornthwaite, C. W., 8.10–65
Tidd, W. H., 8J–112
Timofeev, V. T., 8.10–29
Tipton, C. D., 8J–61
Tohsha, M., 8K–113
Tolbert, C. W., 8J–61
Troitskiĭ, V. N., 8J–149
Trolese, L. G., 8J–114, 8J–132
Tucker, G. B., 8.10–143
Tukizi, O., 8J–187
Tuliakova, L. F., 8.10–270

United Gas Corp., 8.10–149
U. S. Air Weather Service, 8.10–200, 8.10–227, 8.10–280
U. S. Army, 8J–36
U. S. Corps of Engineers, 8.10–30
U. S. National Bureau of Standards, 8J–40, 8J–62, 8J–150, 8J–170, 8J–171, 8J–182
U. S. Navy Electronics Laboratory, San Diego, 8J–37
U. S. Office of Naval Operations, 8J–116
U. S. Quartermaster Corps. Research and Development Branch. Environmental Protection Section, 8.10–276
U. S. Weather Bureau, 8.10–30, 8.10–150, 8.10–260, 8.10–261
U. S. Weather Bureau. National Hurricane Research Project, 8.10–23
Untersteiner, N., 8.10–246
Urbani, M., 8.10–109
Uryvaev, P. A., 8.10–253

Van der Leeden, P., 8.10–243
Van Mieghem, J., 8.10–134, 8.10–136
Vegard, L., 8.10–24
Vetter, M. J., 8J–190
Viaut, A., 8.10–104
Villars, F., 8J–117
Vishnevsky, N. A., 8.10–2
Vittori Antisari, O., 8.10–216
Vladimirov, G. E., 8.10–2
Voeikov, A. E., 8.10–256
Vogan, E. L., 8.10–297
Voge, J., 8J–38, 8J–39
Vogler, L. E., 8J–102, 8J–103
Volz, E., 8.10–217
von Rosenberg, C. E., 8J–15
Voyachet, W. E., 8.10–2
Vysokovskiĭ, D. M., 8J–183

Wadleigh, C. H., 8.10–255
Wahl, E. W., 8.10–112
Wallace, R. C., 8.10–1
Walshaw, C. D., 8.10–131, 8.10–161
Walton, G. F., 8.10–85
Waterman, A. T., Jr., 8J–118
Weatherwise, Boston, 8.10–259
Wehner, H., 8.10–13, 8.10–190
Weintraub, S., 8J–32, 8J–40
Weisskopf, V. F., 8J–117
Welander, P., 8.10–80
Wells, P. I., 8J–90
Wheelon, A. D., 8J–98, 8J–119, 8J–172, 8J–173
White, R. M., 8.10–25
Whiting, R. M., 8.10–110
Wickizer, G. S., 8J–16
Wiesner, J. B., 8J–100, 8J–174, 8J–187
Wiley, J., 8.10–7
Wilkins, E. M., 8.10–188
Williams, C. E., 8J–47
Williams, D. T., 8.10–172
Wilson, C. V., 8.10–27
Wilson, W. T., 8.10–30
Wiltse, J. C., 8J–175
Wireless World, 8J–115
Wong, M. S., 8J–187
Wood, A. J., 8.10–3
World Meteorological Organization, 8.10–34, 8J–151
Wormell, T. W., 8.10–161

Yamada, R., 8J–120
Yoshida, N., 8J–94

Ziemann, R., 8.10–13
Zierep, J., 8.10–204, 8.10–205
Zubian, G. D., 8.10–26

INDEX OF SUBJECTS

Abnormal microwave propagation, 8J–123
Absolute humidity charts, 8J–155
Absolute humidity variations, 8J–155
Absorption of radio waves, 8J–153, 8J–178
Abstract indexes, 8J–98
Addresses, 8.10–41
Aerial navigation, 8.10–57
Aerological data yearbooks, 8.10–96
Air conditioning weather data, 8.10–68
Air-earth current, 8.10–215
Air flow characteristics, 8.10–203
Air-ocean carbon dioxide exchange, 8.10–78
Airborne refractometer data, 8J–14, 8J–125
Airborne refractometers, 8J–186, 8J–190
Airborne time lapse photography, 8.10–86
Aircraft weather reconnaissance, 8.10–86
Airplane propagation observations, 8J–132, 8J–146
Airport landing forecasts, 8.10–59
Alcohol films on snow, 8.10–209
Alisov's classification, 8.10–271
Altitude effects on precipitation, 8.10–64
Altocumulus clouds, 8.10–221
American Meteorological Society publications, 8.10–42
Analog computers, 8J–23
Analytical climatology, 8.10–263
Angel bibliographies, 8J–141
Angels, 8J–141
Angular momentum flux, 8.10–141
Angular momentum transfer, 8.10–142
Anisotropic turbulence, 8J–109
Annual meteorological reports, 8.10–95
Annual pressure variations, 8.10–178
Antarctic research stations, 8.10–32
Anti-crepuscular rays, 8.10–287
Anticyclones, 8.10–177
Arctic expeditions, 8.10–6
Arctic Institute of North America, 8.10–1
Arctic research, 8.10–1
Arctic synoptic climatology, 8.10–27
Areal precipitation, 8.10–237
Arid zones, 8.10–273
Artificial precipitation, 8.10–214
Astronautics, 8.10–51
Astronomical refraction, 8J–33
Atmospheric circulation, 8.10–178
Atmospheric nomenclature, 8.10–46
Atmospheric optics, 8.10–153, 8.10–283
Atmospheric physics, 8.10–12
Atmospheric pollution, 8.10–83, 8.10–121, 8.10–123, 8.10–124, 8.10–126, 8.10–127
Atmospheric pollution control, 8.10–3, 8.10–123
Atmospheric refraction, 8J–33, 8J–52

Atmospheric structure, 8.10–12
Atmospheric turbulence, 8J–26, 8J–118
Auroral catalogs, 8.10–298
Auroral emissions, 8.10–300
Auroral F spectrograms, 8.10–24
Auroral helium lines, 8.10–300
Auroral hydrogen lines, 8.10–300
Auroral luminescence spectra, 8.10–24
Auroral nitrogen bends, 8.10–299
Auroral radiation, 8.10–159
Auroral spectra, 8.10–299, 8.10–301
Auroral V Spectrograms, 8.10–24
Aviation medicine, 8.10–2

Balloon borne refractometers, 8J–165
Balloon soundings, 8.10–99
Bibliography of Chinese climate, 8.10–5
Bibliography on ionosphere, 8J–3
Bioclimatology, 8.10–81, 8.10–275, 8.10–279
Biogeography, 8.10–4
Biography, 8.10–49
Biography of E. E. Fedorov, 8.10–48
Biometeorology, 8.10–274
Biosatellites, 8.10–51
Blue haze, 8.10–286
Body heat regulation, 8.10–275
Boulder (Colo.) Laboratories reports, 8J–150, 8J–170, 8J–171
British Meteorological Office, 8.10–39

California stratus, 8.10–18
Canadian meteorological instruments, 8.10–97
Canadian radiosondes, 8.10–97
Carbon dioxide in oceans, 8.10–78
Catchment basins, 8.10–239
Ceiling and visibility data, 8.10–56, 8.10–281
Charged nuclei, 8.10–215
Chloride nuclei size determination, 8.10–216
Cirrus clouds, 8.10–227
Clear air turbulence, 8.10–55, 8.10–105, 8.10–181, 8.10–185
Climate and human activity, 8.10–7
Climate of Africa, 8.10–8
Climate of Arctic Basin, 8.10–6
Climate of Canada, 8.10–259
Climate of Central Germany, 8.10–14
Climate of China, 8.10–5
Climate of Coimbra, Portugal, 8.10–265
Climate of Heard Island, 8.10–32
Climate of Italy, 8.10–262
Climate of Sana, Yemen, 8.10–19
Climate of Stromboli, 8.10–263
Climatic changes, 8,10–19. 8.10–266, 8.10–267
Climatic classifications, 8.10–65, 8.10–257, 8.10–271, 8.10–273
Climatic data, 8.10–37, 8.10–262, 8.10–263
Climatic data for New Mexico, 8.10–260, 8.10–261
Climatic data inventories, 8.10–264
Climatic indexes, 8.10–276
Climatic stress, 8.10–276
Climatic trends, 8.10–265
Climatic variations and human activity, 8.10–9
Climatic zones, 8.10–257
Climatological bench mark network, 8.10–272
Cloud chambers, 8.10–222
Cloud droplet sampling, 8.10–230
Cloud droplet size distribution, 8.10–230
Cloud formations, 8.10–226
Cloud photogrammetry, 8.10–222
Cloud photographs, 8.10–224
Cloud photography, 8.10–86, 8.10–223
Cloud photography with polaroid, 8.10–231
Cloud physics, 8J–11
Cloud seeding, 8.10–118
Cloud seeding effectiveness, 8.10–116, 8.10–117
Cloud seeding with silver iodide, 8.10–116
Cloudiness-temperature relationships, 8.10–234
Comet tails, 8.10–163
Comfort climate, 8.10–274
Communications development, 8.10–66
Condensation trail data analysis, 8.10–227
Conferences, 8.10–35
Contrail dispersion data, 8.10–22
Convective activity, 8J–127
Convective clouds, 8.10–228
Convective cloud structure, 8J–125
Cooling degree days, 8.10–68
Corpuscular radiation, 8.10–163
Cumulus cloud formation, 8.10–225
Cumulus cloud life cycle, 8.10–223
Cumulus cloud microstructure, 8.10–230
Current depth penetration, 8.10–74
Current flow measurement
Current velocities, 8.10–74
Cyclone development, 8.10–135

Degree-day data, 8.10–62
Depression waves, 8.10–172
Dew, 8.10–219
Dew formation, 8.10–218
Dielectric influences, 8J–158, 8J–181
Differential advection, 8.10–105
Diurnal electrical conductivity variations, 8.10–290
Diurnal field strength variation, 8J–4
Diurnal pressure variations, 8.10–177
Double mass technique, 8.10–63
Drag coefficient of raindrops, 8.10–243
Drop size distribution, 8.10–242
Drop velocities, 8.10–243
Drought frequency, 8.10–15
Dust precipitators, 8.10–3

E layer winds, 8.10–16
Easterly troughs, 8.10–147
Eclipse effects on ionospheric drift, 8.10–16
Eddies, 8J–107
Eddy conductivity, 8.10–139
Ekman's theory, 8.10–80
Electromagnetic wave propagation, 8J–34, 8J–67, 8J–80, 8J–122
Electromagnetic wave propagation velocity, 8J–79
Electromagnetic wave refraction, 8J–34, 8J–67, 8J–80, 8J–122, 8J–189
Electronic computers, 8J–130
Electrostatic precipitators, 8.10–3
Empirical influence functions, 8.10–25
Enlargement of sun and moon near horizon, 8.10–288
Equatorial meteorology, 8.10–174
Erythema, 8.10–82

European weather types, 8.10–200
Evaporation coefficient, 8.10–208
Evaporation control, 8.10–211
Evaporation data, 8.10–210, 8.10–260
Evaporation from desert lakes, 8.10–208
Evaporation from lakes, 8.10–170
Evaporation from pans, 8.10–208
Evaporation from snow surface control, 8.10–209
Evaporation theory, 8.10–207
Evapotranspiration, 8.10–65
Evapotranspiration measurement, 8.10–100
Excessive precipitation, 8.10–240
Excessive rainfall, 8.10–241
Extended forecasting, 8.10–25
Extreme ultraviolet measurements, 8.10–162

500 mb wind charts, 8.10–194
Flight planning, 8.10–58
Flood control, 8.10–254
Flood producing storms, 8.10–237
Floods, 8.10–254
Fluorescence, 8.10–233
Flying weather data, 8.10–281
Fog climatology, 8.10–17
Fog climatology studies, 8.10–18
Fog frequencies, 8.10–220
Fog statistics, 8.10–17
Forecast aids, 8.10–280
Forecasting radar conditions, 8J–20
Forecasting radio-weather conditions, 8J–154
Forest climatology charts, 8.10–65
Forest fire effects on runoff, 8.10–63
Forest microclimatology, 8.10–270
Frankfurt Himalaya Expedition, 1955, 8.10–246
Freezing of cloud droplets, 8.10–213
Freezing rain forecasting, 8.10–213
Freezing temperature probabilities, 8.10–166
Fronts, 8.10–26
Frost, 8.10–168
Frost data, 8.10–93, 8.10–166
Frost free period, 8.10–60
Frost protection, 8.10–60, 8.10–61
Frost resistant crops, 8.10–168

Gales, 8.10–187
Geiger counters, 8.10–291
General circulation, 8.10–140, 8.10–141
Geography textbooks, 8.10–7, 8.10–8
Geomagnetic variations, 8J–110
Glacial ablation, 8.10–246
Glaciation, 8.10–266
Grass minimum thermometers, 8.10–98
Great London fog, Dec. 1952, 8.10–20
Green flash, 8.10–285
Ground conductivity maps, 8J–50, 8J–54
Ground conductivity measurements, 8J–54
Ground refractivity world maps, 8J–156
Ground wave propagation, 8J–162

Hadley circulation, 8.10–142
Hail frequencies, 8.10–247
Harmonic analysis, 8.10–178
Harmonic analysis of waves, 8.10–199
Haze photography, 8.10–231
Heat balance of glaciers, 8.10–246
Heat tolerance, 8.10–274
Heat transfer coefficients, 8.10–169
Heat waves, 8.10–167
Herzberg bands of O_2, 8.10–156
High altitude research stations, 8.10–37
High angle tropospheric propagation, 8J–132
High level turbulence, 8.10–185, 8.10–227, 8J–25
Highways, 8.10–64
Historic auroras, 8.10–298
History of photogrammetry, 8.10–222
History of radio propagation, 8J–123
History of weather forecasting, 8.10–13
Hospital air conditioning, 8.10–278
Hot spell frequencies, 8.10–167
Human geography, 8.10–7
Humid tropics research, 8.10 35
Humidity gradient variation, 8J–151
Humidity lapse rate, 8J–76
Hurricane damage, 8.10–11, 8.10–23
Hurricane damage reports, 8.10–148
Hurricane forecasting, 8.10–23
Hurricane frequency, 8.10–23
Hurricane "Janet" (1955), 8.10–148
Hurricane spiral bands on radar, 8.10–21
Hurricane surges, 8.10–23
Hurricane warnings, 8.10–23
Hurricanes, 8.10–11
Hydrocarbon oxidation, 8.10–125
Hydrologic studies, 8.10–251
Hydrology, 8.10–249
Hygrophotographic plates, 8.10–101

Ice Ages, 8.10–266
Ice in hydraulic installations, 8.10–70
Icing nucleability, 8.10–214
Infrared radiation, 8.10–159, 8.10–160
Infrared spectroscopy, 8.10–99
Insolation, 8.10–269
Instrument design, 8.10–97
Instruments, 8J–74
International Geophysical Year, 1957–1958, 8.10–33
IGY meteorological program, 8.10–34
IGY satellite program, 8.10–52
IGY tropospheric propagation program, 8J–151
Inversion effects on atmospheric pollution, 8.10–83
Inversion effects on radio wave propagation, 8J–51
Inversion frequency charts, 8J–116
Inversions, 8J–2, 8J–31, 8J–39, 8J–154, 8J–163
Inversions in salt lakes, 8.10–170
Ionospheric conductivity, 8.10–290
Ionospheric drift, 8.10–197
Ionospheric drift measurements, 8.10–16
Ionospheric radio wave propagation, 8J–3, 8J–106, 8J–150, 8J–170
Ionospheric scattering, 8J–140, 8J–174
Ionospheric scattering layer height, 8J–139
Ionospheric wind measurement, 8.10–198
Irrigation effects, 8.10–168
Isotachs, 8.10–58

Japanese language, 8.10–45
Jet aircraft contrail photographs, 8.10–22
Jet stream analysis, 8.10–144

Jet stream profiles, 8.10–144
Juvenile textbooks, 8.10–10

Katabatic winds, 8.10–31
Kiev Meteorological Observatory, 8.10–36
Kinematic analysis, 8.10–111
Kinetic energy, 8.10–134, 8.10–141
Kupfer's classification, 8.10–271

Large aerosols, 8.10–122
Large ions, 8.10–215
Lee wave theory, 8.10–205
Lee waves, 8.10–171, 8.10–203, 8.10–204
Liesegang nuclei counting method, 8.10–216
Lightning, 8.10–294
Lightning theory, 8.10–293
Limnological investigations, 8.10–251
Local climates, 8.10–258
Local wind surveys, 8.10–188
Local winds, 8.10–190
Long period records, 8.10–93, 8.10–265
Long range forecasting, 8.10–111, 8.10–112
Low level sounding systems, 8J–24
Lysimeters, 8.10–100

Macroturbulence, 8.10–138
Manuals, 8J–36
Marine atlases, 8J–116
Mars, 8.10–119
Martian atmosphere, 8.10–119, 8.10–120, 8.10–286
Martian meteorology, 8.10–119
Maximum possible precipitation, 8.10–237, 8.10–238
Maximum possible rainfall, 8.10–239
Medical climatology, 8.10–277
Medical meteorology, 8.10–2
Meridional circulation, 8.10–143
Meridional heat flux, 8.10–133
Meridional wind components, 8.10–194
Mesoanalysis, 8.10–268
Meso-analysis of squall lines, 8.10–172
Mesosphere, 8.10–46
Meteorological conferences, 8.10–41
Meteorological effects, 8J–57
Meteorological equipment improvement, 8.10–40
Meteorological instrument research, 8.10–66
Meteorological research, 8J–91
Microseism generation, 8.10–146
Microseism-hurricane relationships, 8.10–146
Microseismic storms, 8.10–146
Microwave field strength fluctuations, 8J–29
Microwave propagation, 8J–30, 8J–48, 8J–58, 8J–72, 8J–74, 8J–95, 8J–121, 8J–134, 8J–147
Microwave propagation forecasts, 8J–7
Microwave propagation studies, 8J–49
Microwave propagation symposia, 8J–37
Microwave refraction, 8J–77
Microwave scattering, 8J–26
Microwave superrefraction forecasts, 8J–124
Microwave transmission, 8J–8
Mie scattering, 8.10–286
Minimum temperatures, 8.10–93
Modified refractive index charts, 8J–116
Moisture balance, 8.10–256
Moisture transport, 8.10–206
Monthly mean temperature data, 8.10–164
Mount Washington Observatory, 8.10–44
Mountain meteorology, 8.10–44
Mullard Radio Astronomy Observatory, Cambridge, England, 8.10–38

Neef's classification, 8.10–271
Night airglow, 8.10–158
Night airglow research, 8.10–155
Night airglow infrared spectrum, 8.10–155
Night airglow spectrum, 8.10–157
Night airglow UV bands, 8.10–156
Nitrogen oxides in atmosphere, 8.10–121
Nocturnal temperature inversions, 8.10–186
Nomograms, 8.10–196, 8J–34
Nuclei height variations, 8.10–289
Nuclei in city air, 8.10–217
Nuclei sources, 8.10–217

Obituaries, 8.10–47, 8.10–50
Objective contour height forecasting, 8.10–25
Objective thunderstorm forecasting, 8.10–114
Observation techniques, 8J–74
Ocean swell decay, 8.10–71
Oceanic ducts, 8J–122
Operation "Overseed," 8.10–117
Orographic effects, 8.10–269
Orographic effects on wind, 8.10–188
Over-water refractive index, 8J–160, 8J–189
Ozone absorption, 8.10–131
Ozone absorption coefficient, 8.10–161
Ozone concentration, 8.10–130
Ozone measurement techniques, 8.10–85

Paleoclimates, 8.10–267
Patterson barometer, 8.10–97
Periodogram analysis, 8.10–165
Photochemistry of smog, 8.10–125
Photoionization of sodium, 8.10–157
Physiological climatology, 8.10–270
Planetary atmospheres, 8.10–140
Plankton effects, 8.10–79
Point discharge, 8.10–295, 8.10–296
Point-to-point radio propagation, 8J–96, 8J–180
Polaroid photography of clouds and haze, 8.10–231
Pollen analysis, 8.10–267
Popular meteorology, 8.10–11, 8.10–12, 8.10–128
Popular meteorology books, 8.10–9
Potential energy, 8.10–134
Potential gradient, 8.10–295
Precipitation composition, 8.10–233
Precipitation data for New Mexico, 8.10–261
Precipitation formation, 8.10–226
Precipitation-ground water relationships, 8.10–14
Precipitation measurement, 8.10–249
Precipitation regime, 8.10–206
Pressure anomalies, 8.10–176
Pressure distribution, 8.10–173
Pressure field specifications, 8.10–27
Pressure height forecasts, 8.10–25
Pressure jump line, 8.10–172
Pressure oscillations, 8.10–174, 8.10–179
Pressure variations, 8.10–175
Pressure waves, 8.10–179
Problems in climatology, 8.10–256

Progress in meteorology, 8.10–40, 8.10–43
Project Cloud Trail, 8.10–227
Propagation experiments, 8J–18, 8J–55
Propagation paths, 8J–177
Public health, 8.10–123
Punched card programs, 8J–185

Radar angels, 8J–141
Radar climatology, 8.10–88
Radar echoes, 8.10–242
Radar echoes from clouds, 8.10–228
Radar hurricane tracking, 8.10–21
Radar meteorology, 8J–1
Radar precipitation echoes, 8.10–90, 8.10–91
Radar precipitation echo duration frequencies, 8.10–88
Radar propagation, 8J–113, 8J–136
Radar propagation ducts, 8J–20
Radar propagation over lakes, 8J–20
Radar rainfall measurement, 8.10–87, 8.10–244
Radar range, 8J–159
Radar reflections from discontinuities, 8J–35
Radar reflection from moon, 8.10–89
Radar refraction corrections, 8J–131
Radiation attenuation, 8.10–153
Radiation back scattering from the ocean, 8J–175
Radiation balance, 8.10–256
Radiation equilibrium of MOUSE, 8.10–54
Radiation measurement during eclipse, 8.10–94
Radiation transmission through clouds, 8.10–229
Radio antenna heights, 8J–179
Radio climatology, 8J–12
Radio communication, 8J–48, 8J–50, 8J–75
Radio communication maps, 8J–153, 8J–156
Radio communication range, 8J–18, 8J–55
Radio echoes, 8J–9
Radio emission from auroras, 8.10–302
Radio fading, 8J–41, 8J–43, 8J–70, 8J–85, 8J–87, 8J–89, 8J–90, 8J–94, 8J–101, 8J–102, 8J–114, 8J–168, 8J–178
Radio fading distribution, 8J–84
Radio fading instruments, 8J–87
Radio fading patterns, 8.10–303, 8J–39
Radio field strength, 8J–18, 8J–104, 8J–152, 8J–179
Radio field strength data, 8J–177
Radio field strength fluctuations, 8J–55, 8J–110
Radio frequency radiation from auroras, 8.10–297
Radio holes, 8J–13
Radio instrumentation, 8J–133
Radio meteorology, 8J–32, 8J–38
Radio meteorology conferences, 8J–11
Radio noise, 8.10–292
Radio observatories, 8.10–38
Radio propagation beyond the horizon, 8J–41, 8J–45, 8J–65, 8J–123, 8J–128, 8J–146
Radio propagation beyond the horizon, (94Mc), 8J–167
Radio propagation over water, 8J–167
Radio transmission, 8J–10, 8J–69, 8J–71, 8J–78, 8J–85, 8J–95, 8J–102, 8J–105, 8J–112, 8J–114
Radio transmission ducts, 8J–4, 8J–5, 8J–13, 8J–17, 8J–67, 8J–92, 8J–94, 8J–99, 8J–108
Radio transmission loss, 8J–28, 8J–93, 8J–182, 8J–184
Radio wave diffraction, 8J–89, 8J–93, 8J–94
Radio wave propagation, 8J–3, 8J–25, 8J–36, 8J–61, 8J–63, 8J–64, 8J–70, 8J–80, 8J–86, 8J–91, 8J–101, 8J–102, 8J–166
Radio wave propagation abstracts, 8J–88
Radio wave propagation bibliographies, 8J–21, 8J–96
Radio wave propagation computations, 8J–97
Radio wave propagation data analysis, 8J–130
Radio wave propagation symposia, 8J–187
Radio wave scattering, 8J–19, 8J–75, 8J–82, 8J–90, 8J–107, 8J–109, 8J–117, 8J–119, 8J–144
Radio wave scattering theories, 8J–44, 8J–98, 8J–133, 8J–157, 8J–158, 8J–162, 8J–164, 8J–176, 8J–179
Radio waves, 8J–52
Radioactive fallout, 8.10–84
Radioactive snow gages, 8.10–103
Radioactivity in the atmosphere, 8.10–291
Radiocarbon concentration, 8.10–78
Rain gage lamp protector, 8.10–98
Rain gage networks, 8.10–87
Rain structure, 8.10–91
Raindrop size distribution measurement, 8.10–101
Rainfall cycles, 8.10–235
Rain fall depth duration data, 8.10–238
Rainfall index, 8.10–234
Rainfall intensities, 8.10–90, 8.10–236, 8.10–238
Rainfall intensity duration data, 8.10–30
Rainfall probabilities, 8.10–15
Rainfall-runoff relationships, 8.10–250
Rainfall variation with height, 8.10–244
Rainy season, 8.10–234
Rayleigh scattering, 8.10–283
Refractive index, 8.10–283, 8J–2, 8J–8, 8J–14, 8J–15, 8J–23, 8J–27, 8J–32, 8J–47, 8J–49, 8J–52, 8J–57, 8J–68, 8J–73, 8J–77, 8J–127, 8J–137, 8J–186
Refractive index charts, 8J–160
Refractive index computations, 8J–40, 8J–122, 8J–183
Refractive index data, 8J–185
Refractive index discontinuities, 8J–35
Refractive index distribution, 8J–6
Refractive index forecasting, 8J–12, 8J–165
Refractive index in clouds, 8J–125
Refractive index inhomogeneities, 8J–141, 8J–145
Refractive index maps, 8J–138
Refractive index measurement, 8J–169
Refractive index profiles, 8J–13, 8J–138, 8J–152, 8J–154
Refractive index studies, 8J–155
Refractive index variations, 8J–164
Refractivity gradient climatology, 8J–42
Refractometer measurements, 8J–173
Refractometer observations, 8J–151

Refractometers, 8J–68, 8J–127, 8J–169
Regional planning, 8.10–269
Reproductive index measuring equipment, 8J–24
Reservoir ice, 8.10–70
Resort climatology, 8.10–277
Reviews, 8.10–127
Reynolds number, 8.10–243
Roll clouds, 8.10–224
Royal Meteorological Society, 8.10–43
Runoff evaluation, 8.10–212
Runoff forecasting, 8.10–113
Runoff from small watersheds, 8.10–248, 8.10–250

Salt deposits, 8.10–170
Sand transport, 8.10–191
Sand transport by wind, 8.10–193
Satellite observations, 8.10–162
Satellite observatories, 8.10–51, 8.10–53
Satellite orbits, 8.10–52
Satellite temperature calculations, 8.10–54
Scatter propagation, 8J–174
Scatter propagation theories, 8J–103
Scattering, 8J–97
Scattering of light, 8.10–284
Scorer's 1^2 parameter, 8.10–171
Sea breezes, 8.10–139
Sea ice, 8.10–108
Sea wave recorders, 8.10–77
Sferics wave forms, 8.10–92
Shallow water waves, 8.10–76
Shape of sky, 8.10–288
Shear line case histories, 8.10–182
Short range forecasting, 8.10–201
Short wave radio fading, 8J–135
Short wave radio propagation, 8J–22, 8J–57, 8J–73, 8J–76, 8J–137
Silver iodide decay rate, 8.10–117
Silver iodide effectiveness, 8.10–117
Sky temperature, 8.10–154
Slide rules, 8J–40
Slow tails, 8.10–92
Smudging of orchards, 8.10–61
Snow, 8.10–10
Snow cover, 8.10–64, 8J–147
Snow melt effects on river discharge, 8.10–252
Snow melt intensity, 8.10–252
Snow melt loss, 8.10–253
Snow melt runoff, 8.10–253
Snow microclimatology, 8.10–102
Snow storage, 8.10–253
Snow thermometers, 8.10–102
Snowfall probabilities, 8.10–245
Sodium lines, 8.10–157
Soil erosion, 8.10–192, 8.10–236
Soil freezing, 8.10–169
Soil moisture effects on plants, 8.10–255
Soil moisture exchange, 8.10–206
Soil thawing, 8.10–169
Solar cycles, 8.10–145
Solar eclipse, Feb. 1952, 8.10–94
Solar eclipse, June 1955, 8.10–282
Solar eclipse observations, 8.10–282
Solar energy utilization, 8.10–69
Solar flare effects on ionosphere, 8.10–132
Solar radiation on slopes, 8.10–152
Solitary wave theory, 8.10–76
Southern oscillation, 8.10–145
Spectrophotometric observations, 8.10–158
Spherical harmonics, 8.10–173
Sporadic E layer (Es) drift, 8.10–16
Squall lines, 8.10–151
Stability forecasting, 8.10–105
Stack effluent diffusion, 8.10–20
Stack meteorology, 8.10–20
Standard atmosphere, 8.10–283
Standard deviation computation, 8.10–189
Standard waves, 8.10–221
Statistical analysis, 8J–47
Statistical forecasting, 8.10–112
Statistical surveys, 8J–15
Steppe climates, 8.10–270
Storm floods, North Sea (Feb. 1953), 8.10–135
Storm frequency, 8.10–73
Storm rainfall, 8.10–237
Storm surges, 8.10–75
Storm surge calculation, 8.10–75
Storm surge effects on sea level, 8.10–75
Storm surge warnings, 8.10–80
Stratosphere, 8.10–46
Stratus effects on temperature, 8.10–18
Stratus frequencies, 8.10–232
Sub-refraction, 8J–159
Sukhovei, 8.10–270
Sulphur dioxide in the atmosphere, 8.10–124
Summer climate of San Francisco Bay area, 8.10–18
"Sunrise effect" on condensation nuclei, 8.10–215
Superrefraction, 8J–20, 8J–43, 8J–51, 8J–113, 8J–188
Superrefraction effects on radar, 8J–132
Superrefraction layers, 8J–129
Surface charts, 8.10–110
Surface wind-drizzle relationships, 8.10–180
Symposia, 8J–91, 8J–166
Synoptic analysis, 8.10–27, 8.10–107, 8.10 195
Synoptic case histories, 8.10–26, 8.10–241
Synoptic climatology, 8.10–88, 8.10–279, 8.10–280
Synoptic conditions for freezing drizzle, 8.10–213
Synoptic conditions for gale force winds, 8.10–187
Synoptic conditions for tornadoes, 8.10–110
Synoptic meteorology of Eastern Europe, 8.10–26
Synoptic refractive index studies, 8J–138
Synoptic studies, 8.10–104, 8.10–232, 8J–148
Synoptic types, 8.10–109

Television reception, 8J–53
Television weather broadcasts, 8.10–67
Temperature calculations, 8.10–115
Temperature forecasting, 8.10–115
Temperature inversions, 8.10–124, 8J–148
Temperature periodicities, 8.10–165
Temperature variations, 8.10–164
Terrain effects on microwave propagation, 8J–147
Terrain effects on wave propagation, 8J–93
Texas Eastern Transmission Corporation, 8.10–149
Textbooks, 8.10–2, 8J–3, 8J–133
Thermal balance of human body, 8.10–276
Thermodynamics, of clouds 8.10–137
Thunderstorm electricity, 8.10–292
Thunderstorm forecasting, 8.10–114

Thunderstorm frequencies, 8.10–114
Tomato crops, 8.10–62
Topographic effects on tropospheric propagation, 8J–16
Topographic influences, 8J–30, 8J–44, 8J–50, 8J–121, 8J–126, 8J–134
Tornado forecasting, 8.10–110
Tornado frequency charts, 8.10–150
Town planning, 8.10–258
Trade wind cumulus clouds, 8.10–225
Trans-Canada Airlines, 8.10–58
Translations, 8J–123
Tropical vegetation, 8.10–35
Tropopause analysis, 8.10–182
Tropopause wind maximum, 8.10–129
Troposphere, 8J–82, 8J–98
Tropospheric layers, 8J–58
Tropospheric profiles, 8J–169
Tropospheric propagation, 8J–2, 8J–3, 8J–7, 8J–8, 8J–12, 8J–13, 8J–18, 8J–19, 8J–20, 8J–23, 8J–31, 8J–35, 8J–36, 8J–42, 8J–44, 8J–62, 8J–71, 8J–75, 8J–76, 8J–90, 8J–100, 8J–103, 8J–106, 8J–115, 8J–120, 8J–124, 8J–126, 8J–129, 8J–148, 8J–158, 8J–167, 8J–173, 8J–177, 8J–187, 8J–188
Tropospheric propagation beyond the horizon, 8J–46, 8J–112, 8J–118, 8J–180
Tropospheric propagation bibliographies, 8J–56, 8J–111, 8J–170, 8J–171
Tropospheric propagation data, 8J–66
Tropospheric propagation observation program, 8J–151
Tropospheric propagation over water, 8J–63
Tropospheric propagation research, 8J–150, 8J–170, 8J–171
Tropospheric propagation symposia, 8J–142
Tropospheric radio wave propagation, 8J–11, 8J–83
Tropospheric refraction, 8J–14, 8J–32, 8J–33, 8J–72, 8J–110, 8J–181, 8J–183
Tropospheric refraction theory, 8J–149
Tropospheric scattering, 8J–69, 8J–114, 8J–161, 8J–178, 8J–181 to 8J–185, 8J–190
Tropospheric scattering layer height, 8J–139
Tsunamis, 8.10–45
Tuberculosis, 8.10–277
Turbidity factor, 8.10–217
Turbulence-aircraft icing relationships, 8.10–55
Turbulence effects, 8J–86, 8J–101, 8J–102, 8J–107, 8J–144, 8J–168
Turbulence fluctuations, 8J–117
Turbulence in inversions, 8.10–184
Turbulence near the ground, 8.10–184
Turbulence reports from aircraft, 8.10–55
Turbulence spectrum, 8J–38, 8J–172
Turbulence theory, 8.10–189
Turbulent transfer of moisture, 8.10–207
Twilight phenomena, 8.10–287
Twilight sodium spectra, 8.10–157
Two meter DX, 8J–76

UHF radio propagation, 8J–115, 8J–129, 8J–189
Ultrashort wave propagation, 8J–53, 8J–60, 8J–81, 8J–99, 8J–119, 8J–140, 8J–143, 8J–163
Ultrashort wave propagation data, 8J–83
Ultraviolet ionization of upper atmosphere, 8.10–132
Ultraviolet radiation effects, 8.10–82
Underground water, 8.10–251
U. S. Advisory Committee on Weather Control, 8.10–117
U. S. Weather Bureau network, 8.10–272
Upper air analysis over oceans, 8.10–72
Upper air data, 8J–34
Upper air humidity, 8J–9
Upper air pressure variations, 8.10–28
Upper air soundings, 8.10–96
Upper air wind analysis, 8.10–129, 8.10–195, 8.10–196
Upper air wind forecasting, 8.10–182
Upper air wind frequencies, 8.10–202
Upper air wind variability, 8.10–200
Upper air winds, 8.10–201
Upper atmosphere instruments, 8.10–128
Upper atmospheric structure, 8.10–128

Vector mean winds, 8.10–196
Vertical-meridional circulation, 8.10–142
Vertical ozone distribution, 8.10–130
Vertical wind shear, 8.10–183
VHF field strength, 8J–105
VHF fading, 8J–16
VHF radio propagation, 8J–79, 8J–129
Visibility, 8J–27
Vorticity equations, 8.10–136
Vorticity transport, 8.10–136

Water balance of oceans, 8.10–29
Water drops, 8J–27
Wave heights, 8.10–76
Wave periods, 8.10–76
Waves in the westerlies, 8.10–199
Weather cycles, 8.10–145
Weather modification, 8.10–118
Weather Ship J., 8.10–73
Weather ships, 8.10–72
Weather types, 8.10–107
Weber's function, 8J–120
Weber's number, 8.10–243
Well levels, 8.10–212
Western disturbances, 8.10–147
Wind divergence, 8.10–177
Wind driven currents, 8.10–74
Wind effects on point discharges, 8.10–295, 8.10–296
Wind effects on shallow water, 8.10–80
Wind erosion, 8.10–192
Wind estimations, 8.10–79
Wind field analysis, 8.10–199
Wind-pressure variability, 8.10–189
Wind sorting of sand particles, 8.10–193
Wind speed, 8.10–195
Wind speed effects on fine soil transport, 8.10–192
Wind speed maximum, 8.10–186
Wind speed profiles, 8.10–186
Wind structure in frontal zones, 8.10–183
Wind tunnel experiments, 8.10–191
Wind velocities, 8.10–191
Wired sondes, 8J–24
World humidity maps, 8J–153
WMO participation in IGY, 8.10–34

Zonal circulation, 8.10–138, 8.10–139
Zonal wind components, 8.10–194

INDEX OF GEOGRAPHICAL LOCATIONS

NORTHERN HEMISPHERE, 8.10–142
POLAR REGIONS, 8.10–28
AFRICA, 8.10–8
West Africa, 8.10–151
Belgian Congo, 8.10–15
Morocco, 8.10–210
South Africa
Durban, 8J–108
ASIA
Bay of Bengal, 8J–160
China, 8.10–5
Ceylon, 8.10–282
Hong Kong
Sek Kong Airport, 8.10–56
India, 8.10–147
Bombay, 8.10–167
Dum Dum Airport, Calcutta, 8J–188
Kodaikanal Observatory, 8.10–231
Nanjanad, 8.10–93
North Assam, 8.10–220
West Rajasthan, 8.10–187
Israel, 8.10–212
Tel Aviv, 8.10–235
Japan, 8.10–298, 8J–94
Hiraiso, 8J–148
Kanto District, 8J–113
Kokubunjii, 8J–148
Lake Shikaribetsu, 8.10–103
Tateno, 8J–60
Tokyo, 8J–64
Karakoram Mts.
Chogo Lungma Glacier, 8.10–246
Pakistan
Punjab, 8.10–236
Persian Gulf, 8J–160
Singapore, 8.10–201, 8.10–202
Tengah, 8.10–240
South China Sea, 8J–160
U.S.S.R. (in Asia), *see also* U.S.S.R. *under* Europe
Western Siberia, 8.10–206
Yemen, 8.10–19
Sana, 8.10–19
AUSTRALASIA
Australia, 8.10–230, 8.10–273, 8J–51, 8J–189,
Cotter River Valley, 8.10–239
New South Wales
Broken Hill, 8.10–211
Queensland
Little Nerang Creek, 8.10–238
Victoria
Melbourne, 8.10–287
EUROPE, 8.10–109, 8.10–280
Central Europe, 8.10–267
Austria, 8.10–96
Vienna Woods, 8.10–64
Belgium
Uccle, 8J–137
British Isles
Great Britain
England, 8.10–232, 8J–92
Staythorpe, 8.10–126
Scotland
Lossienmouth, 8.10–181
Wales
Cardigan Bay, 8J–5
Ireland
Valentia, 8.10–133
Bulgaria, 8.10–251
Finland, 8.10–95
Helsinki Airport, 8.10–17
France
Paris, 8.10–164
Germany
Bad Kissingen, 8.10–264
Central Germany, 8.10–14
Elbe Valley, 8.10–190
German Coast, 8.10–108
Norderney, 8.10–193
Italy, 8.10–262
Rome, 8.10–171
Stromboli, 8.10–263
North Sea, 8J–167
Norway
Kjeller, 8.10–16
Lapland, 8.10–209
Tromsö, 8.10–24
Poland, 8.10–111
Portugal
Coimbra, 8.10–265
Switzerland, 8.10–277
U.S.S.R. (European and general), 8.10–26, 8.10–60, 8.10–61, 8.10–62, 8.10–177, 8.10–257, 8.10–266
Bol'shoi Glushits District, 8.10–270
Kaluga, 8.10–252
Kuibyshev Oblast, 8.10–270
Moscow, 8.10–115
Rostov Oblast, 8.10–168
NORTH AMERICA, 8.10–25
Alaska, 8.10–30, 8J–138
Canada, 8.10–97, 8.10–259
Labrador
Goose Bay, 8.10–281
Northern Canada, 8J–52
Manitoba
Winnipeg, 8.10–281
Newfoundland, 8J–70
Gander, 8.10–281
Nova Scotia
Halifax, 8.10–180
Sydney, 8.10–281
Ontario
Ottawa, 8.10–297
Scarboro, 8J–20
Quebec
Montreal, 8.10–281
Caribbean Region
West Indies
Barbados, 8.10–148
Greenland, 8.10–30
Lake Ontario, 8J–20
United States, 8.10–150, 8.10–227, 8.10–245, 8.10–272, 8J–12, 8J–42, 8J–155
Central United States, 8.10–182
East Coast, 8.10–23, 8J–47
Eastern United States, 8.10–241
Great Plains, 8.10–237
Lake Michigan, 8J–33
Pacific Coast, 8J–14
Richmond, Va. to Washington, D. C., 8J–57
West Coast, 8J–47
Western United States, 8.10–113
Arizona, 8.10–226, 8.10–234
Fort Huachuca, 8J–124, 8J–190
California, 8J–15
Imperial Valley, 8.10–154
Los Angeles, 8.10–125
San Diego, 8J–37
San Francisco Bay, 8.10–18
Santa Ynez Watershed, 8.10–63
Silver Lake, 8.10–208
Southern California, 8J–129
Colorado
Boulder, 8J–150, 8J–170, 8J–171
Cheyenne Mt., 8J–65, 8J–66
Pikes Peak, 8J–93
District of Columbia (Washington), 8J–134
Florida
Edwards Air Force Base, 8.10–22
Key West, 8J–30

Miami, 8J–30
North Florida, 8.10–116
Idaho
Snake River Valley, 8.10–188
Illinois, 8.10–228
Edwardsville, 8.10–248
Goose Creek, 8.10–87
Maryland
Baltimore, 8J–134
Nebraska, 8.10–130
Nevada
Nevada Proving Grounds, 8.10–200
New Hampshire
Mt. Washington, 8.10–44, 8.10–117
White Mountains, 8.10–37
New Mexico, 8.10–130, 8.10–260, 8.10–261
New York, 8J–95
New York City, 8.10–124
Ohio
Cincinnati, 8.10–67
Southern Ohio, 8J–14, 8J–47
Southwest Ohio, 8J–15
Wilmington, 8.10–172
Oregon, 8.10–234
Pennsylvania
Pittsburgh, 8J–58
State College (University Park), 8J–58
Texas, 8J–22
Austin, 8J–11
El Paso, 8.10–114
Utah
Salt Lake City, 8.10–83
Washington, 8.10–166
Washington coast, 8J–15
South America
Southern South America, 8.10–178
Oceans, Seas and Islands
Antarctica, 8.10–31, 8.10–178
Adélie Land, 8.10–31
George V Coast, 8.10–31
Arctic, 8.10–1, 8.10–27
American Arctic, 8.10–30
Arctic Ocean, 8.10–6, 8.10–29
Atlantic, 8J–116
North Atlantic, 8.10–71, 8.10–73, 8.10–176, 8J–105
Northeastern Atlantic, 8.10–55
Iceland, 8.10–30
Indian, 8.10–104
South Indian, 8.10–32
Heard Island, 8.10–32
Mediterranean Sea, 8.10–129, 8J–160
Pacific, 8J–15, 8J–116
Hawaiian Islands, 8.10–194, 8.10–230